C
IZe3Ica
1951
copy 2

# CAREERS IN ENGINEERING

UNIVERSITY OF ILLINOIS
MAR 23 1967
LIBRARY

1951

UNIVERSITY OF ILLINOIS
BULLETIN

UNIVERSITY OF ILLINOIS BULLETIN

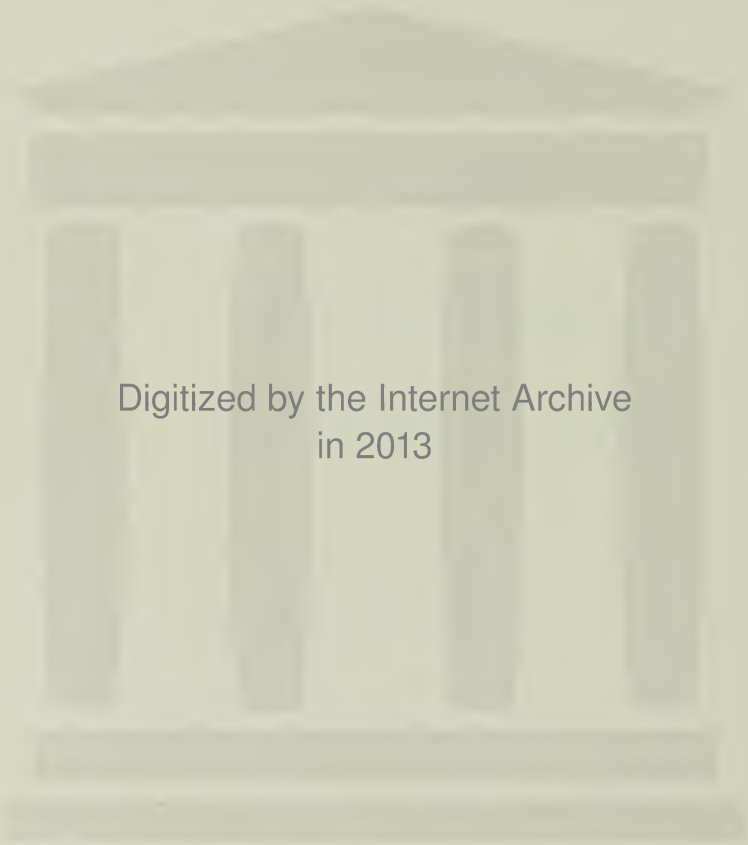
Volume 48 March, 1951 Number 52

Published seven times each month by the University of Illinois. Entered as second-class matter December 11, 1912, at the post office at Urbana, Illinois, under the Act of August 24, 1912. Office of Publication, 358 Administration Building, Urbana, Illinois.

1951

# CAREERS IN ENGINEERING

*An announcement of the College of Engineering at the University of Illinois, published by the University in Urbana*


Digitized by the Internet Archive
in 2013

http://archive.org/details/careersinenginee1951univ

C
IZe3Ica
1951
cop. 2

## CONTENTS

**I. Choose Your Career Carefully** . . . . . 5
Make a List of the Careers — Analyze Yourself — Analyze the Careers — Compare and Choose

**II. What You Need to Know About Engineering** . . . . . 11
What Is Engineering? — The "Engineering Method" — What Kind of Person Is an Engineer? — Kinds of Engineering Jobs — Kind of Education Needed

**III. Gaining an Education at Illinois** . . . . . 35
The Pioneers — The College Makes Some Major Changes — Recent Major Developments — Meeting Your Needs — The Common Program for Freshmen — Electives — Engineering Courses — The Engineering Curricula — Student Advisors — Developing Personality and Good Citizenship — Graduate Study

**IV. What Have You Learned?** . . . . . 80

# 1. CHOOSE YOUR CAREER CAREFULLY

Too many people tackle the problem of selecting their career by putting the cart before the horse — they decide that they want to enter a certain field of work and then try to adjust their personality, abilities, and education to meet the requirements of that field. The procedure should be reversed. You should select the career to which your abilities are best suited.

Even if your mind is already made up, it is never too late to investigate seriously the problem of selecting a career that is compatible with your abilities. How can you be reasonably certain, for example, that you will make a good engineer? Would the professions of law or medicine be better suited to you?

The number of careers from which you can choose is almost unlimited, but choose you must, and the choice should be made carefully and intelligently if you are to live happily. Of course there are some people who spend all of their lives sitting on the fence of indecision, but they are generally useless to everyone — most of all to themselves. Though even a poor decision is better than none at all, certainly greater personal happiness and community service result from a good decision.

Selecting your career is not an easy job nor should it be so considered. Any systematic procedure that you use to make a good selection involves a lot of hard work. There are any number of methods which will give you an intelligent decision about your career; the following suggested method is only one of them.

1. Make a list of the careers you're interested in
2. Analyze yourself
3. Analyze the possible careers you have selected
4. Compare the results of each of the career analyses with the analysis of yourself to determine which of these is the best suited to you
5. Of the group of careers remaining from step 4, select the one you're most interested in

Engineering Library

## MAKE A LIST OF THE CAREERS

The first step should be to make a list of the fields that you think you want to enter. When you make this list, your personal desire is the only thing you need to consider. If you find your list has only one or two possibilities, it would be advisable at this point to spend a little time reading and talking with people about other fields that you don't know about. You may find that some of them are more interesting than you thought they were.

To say that this step is the most important would be a little like saying that a man can't get along very well without his eyes. The statement is true enough but incomplete. He can't do very well without his arms or legs either. The job of making an intelligent selection is now only partly done, but a great many people stop here and choose a career with regard only for their personal desires. This method of selection produces too many disappointing experiences and too many misfits in the careers.

## ANALYZE YOURSELF

The second step is probably the most difficult to perform accurately, because to get true results you must develop an objective attitude. To analyze yourself means simply that you need to break yourself up into little pieces and then study each of these pieces to see what effect each has on your entire self. To analyze yourself objectively means, in effect, that you need to stand in front of a mirror, divorce yourself completely from the fellow looking back at you, and then break him into small parts.

This analysis should include such items as:

1. Your personality
2. Your physical aptitudes and handicaps
3. Your mental abilities and limitations

Just remember that, in evaluating the results, intentional omission of an item here and there damages only yourself. Be fair though not excessively critical in your judgment.

Since an objective attitude is hard for most people to achieve, professional organizations will perform the job for you by means of vocational guidance examinations and aptitude tests. Such tests are admittedly not perfect, but their results are generally much closer to the truth than your own, because they have the advantage of an impartiality that you cannot attain. The only caution you need to observe is to be reasonably certain that you enlist the services of a reputable organization.

## ANALYZE THE CAREERS

The next part of your job — analyzing the possible careers you have selected — should be done in several ways, depending upon the sources of information available to you. Most public libraries contain a wealth of such information. If you can't find it readily, the librarian will be glad to assist you. To obtain a practical viewpoint you should talk with men who are actually in the field of work. In addition most universities and colleges or professional and trade organizations representing the various fields will gladly furnish you with information.

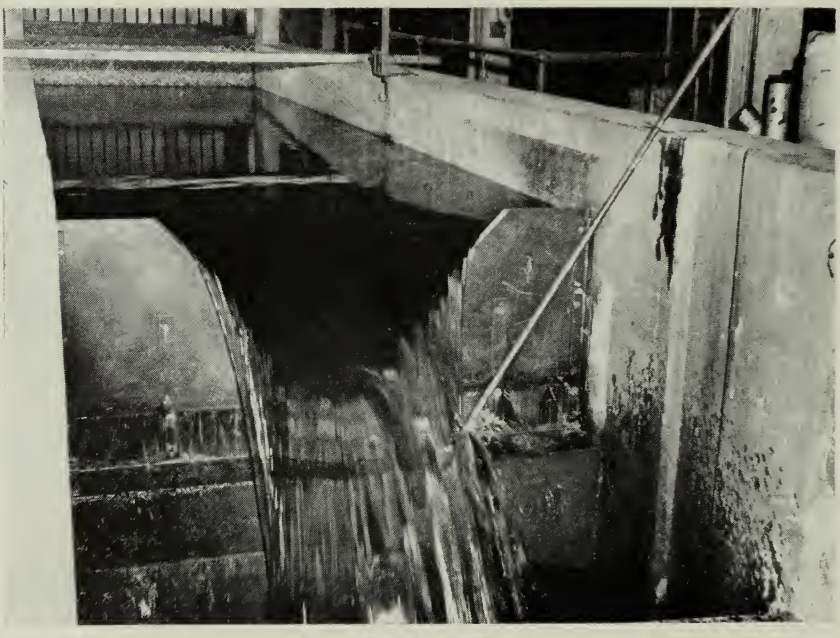
Any of these sources, however, should be carefully examined for evidence of partiality. For example, any source that advises you to forget about such and such a field because it is overcrowded or to enter that field because it offers excellent opportunities may be biased. You can usually detect the bias by the amount of stress your informant places on "opportunities." Frequently too much importance is attached to them. In the first place, overcrowdedness and opportunities in a field can change almost overnight. Secondly, if your self-analysis shows that you possess sufficient mental capacity, you can be successful even against stiff competition. In the final analysis the importance that you give to these or any other items is up to you.

The following items will help you determine the kind of information you need about a particular career. You may find that some items do not apply in your case or that questions not included need answering.

1. Types of jobs available in the field:
   In general each main career heading, such as engineering, agriculture, journalism, etc., can be broken down under any one of several systems of classification into different jobs. Three such systems are discussed later for the engineering profession.
2. Educational requirements:
   This point is particularly important because indirectly it gives the answer to the question of mental and manual skills that you need for the job.
3. Personality of the "average" individual in the field:
   A complete knowledge of this item is necessary to assure that you can find happiness in your work. Like your own personality, it is also difficult to determine accurately.
4. Types of industries offering employment:
   In any field these usually cover a wide range from manufacturing to service organizations.

5. Number of people in the field:
   This gives you a rough idea of the amount of competition you can expect. Your information on this point should be right up-to-date. In fact, you should try to get reliable forecasts for the time when you expect to be looking for a job.
6. Social prestige of the field:
   Although this item should be given some consideration, it shouldn't weigh more than the importance of the job itself. After all, our society, which quietly raises its eyebrows at the local garbage collector, would soon lower them without his services.
7. Remuneration:
   The average salaries together with the lowest and highest paid are important; but don't forget that there is more to remuneration than money.

Notice that after you finish the first item in the list you end up with several different types of jobs. In general, each of these should be investigated for the remaining items of the list. Even in one particular branch of a business, profession, or trade, the specific jobs in that branch may be so diversified that no two requirements will be identical.



*V-notch weir used to measure the discharge rate of a pump*

*A ram jet with vortex generators on the whirl test stand*

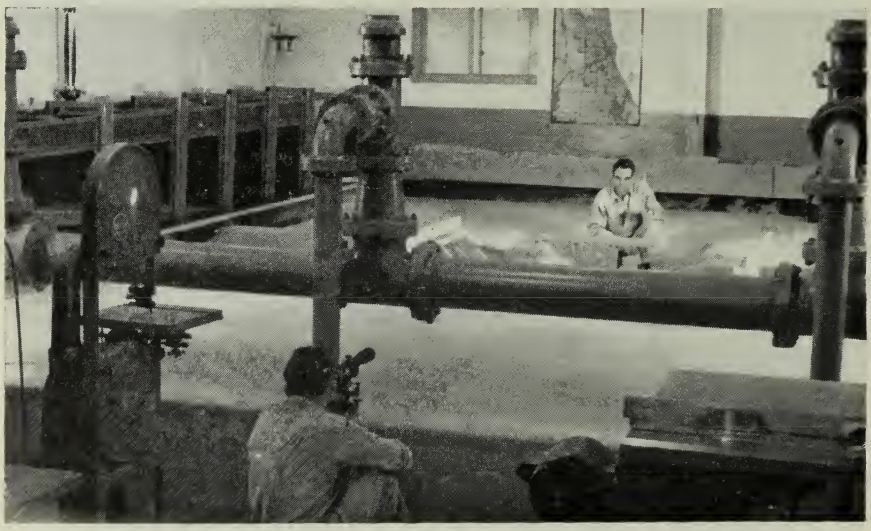
## COMPARE AND CHOOSE

One of the final steps in selecting your career is to compare each of these career analyses with the analysis of yourself. This is not difficult to do, but it will probably lead you to the disturbing conclusion that no career fits you exactly. In fact you'll probably find that several careers come pretty close to fitting you. This ambiguous result is to be expected. Although you must now make another choice among the careers of this group, you shouldn't be discouraged into feeling that all of your work has been futile. The final selection again depends upon your personal desires, but you can feel fairly certain that into whatever career of this group you decide to go, your chances for success and happiness have been multiplied a hundredfold.

Rather than make such an important decision overnight, take some time to let your ideas develop. They will make sense to you in due time.

The only part that should be performed as soon as possible is the analysis of yourself. If done during your junior year or the early part of your senior year in high school, it will help to answer the question whether or not you should enter a career that requires a college education. A preliminary investigation to determine your general field of study should also be undertaken before you enter college, but is not absolutely necessary. Since most college courses are not specialized until the junior year, any decision about specializing should wait until you have completed at least a year or two in college and have had an opportunity to become better acquainted with the field.

Before proceeding to the next section, which contains a description of the engineering profession, there is a final thought which you should consider. Keep in mind that many apparently unrelated fields of work can be successfully combined into a single career. Engineering and law, engineering and commerce, and medicine and law, with one of the two predominating, are just a few of the possible combined careers that can be made to fit you more closely. Few people recognize the possibility of such combinations. Being aware of it may help you to plan some of your college elective courses with more than just random purpose. Of much greater importance, however, is the advantage you gain by satisfying the most important requirement for choosing a career — namely, selecting the career to fit you rather than trying to adjust yourself to fit the career.



*A bridge pier erosion model in the Hydraulic Engineering laboratory*

## II. WHAT YOU NEED TO KNOW ABOUT ENGINEERING

So far we have tried to give you a few of the fundamental ideas you should think about in order to make an intelligent choice of a career. We have also described one procedure you can use to make this choice. Now we take up the narrower — but still very broad — question: What is the nature of the engineering profession?

### WHAT IS ENGINEERING?

The dictionary will show that "engineer" and "ingenuity" come from the same Latin word, "ingenium," meaning *natural ability* or *skill.* In this sense, then, an engineer is a person who has the natural ability to perform his job ingeniously. Such ingenuity was demonstrated by the engineer who, when faced with the problem of stringing cable through a winding pipe, solved his problem by tying a piece of string to the tail of a cat and coaxing her through the pipe by a blast of air from the rear. Of course this kind of solution isn't common, but it does show the open-mindedness that an engineer must have when he seeks the answer to a practical problem.

In the modern professional sense a better definition is this:

> *Engineering is the art and science by which the properties of nature and the sources of power in nature are made useful to man.*

Similarly, the engineer is defined thus:

> *An engineer is a person specifically trained and experienced in the use of materials, men, and money so that these forces are put to the service of man.*

Occasionally you may hear some technicians, craftsmen, artisans, or skilled operators of equipment referred to as engineers. Though the careers these men follow are important to society, and though you may even find that one of them suits you better than engineering itself, the discussion here deals with the engineer as a professional man.

Many of you are probably acquainted with the term "professional" and are partly aware of the differences which set off the professional man from others. Like the members of any profession, engineers are largely guided in their actions by an unwritten code of ethics which has been built up by tradition and which is grounded on the basic principle that the engineer must be honest with his superiors, his colleagues, his subordinates and, above all, *himself.*

Frequently there is some confusion about an engineer as a professional man because most engineering projects require the services of three distinct groups of industrial workers: (1) professional engineers, (2) technicians, and (3) skilled artisans. This confusion is readily cleared up by the definition of a professional employee used in the Taft-Hartley Bill, title I, section 101, sub-section 2, paragraph 12:

The term Professional Employee means

(a) an employee engaged in work

(i) predominantly intellectual and varied in character as opposed to routine mental, manual, mechanical, or physical work;

(ii) involving the consistent exercise of discretion and judgment in its performance;

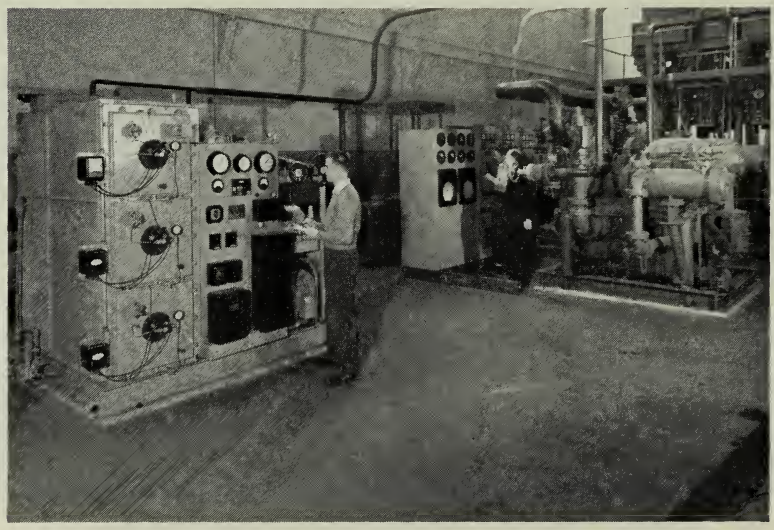
(iii) of such character that the output produced or the result accomplished cannot be standardized in relation to a given period of time;

(iv) requiring knowledge of an advanced type in a field of science or learning customarily acquired by a prolonged course of specialized intellectual instruction and study in an institution of higher learning or a hospital, as distinguished from a general academic education or from an apprenticeship or from training in the performance of routine mental, manual, or physical processes; or

(b) any employee, who

(i) has completed the courses of specialized intellectual instruction and study described in clause (iv) of paragraph (a), and

(ii) is performing related work under the supervision of a professional person to qualify himself to become a professional employee as defined in paragraph (a).



*A Unit Power Plant in Mechanical Engineering*

*A class in the Chemical Engineering Unit Operations laboratory*

## THE "ENGINEERING METHOD"

So far we have defined engineering in both the dictionary sense and the professional sense. However, you need a still more complete picture of what engineering is. You can get this by knowing how the engineer works. Generally the engineer does not merely make the properties of nature useful to man; he does so in a particular way. The method he uses to solve a problem ordinarily consists of the following steps:

1. Studying the nature of the problem and its scope.
2. Analyzing the problem into its component parts.
3. Determining all relationships which may exist among the component parts.
4. Evaluating the various factors involved in each part, making use of all the available knowledge gained by experience, experiment, and research. This evaluation simply means that each factor is cataloged according to its importance. Consequently, at this point all those factors which are judged to have a negligible effect are

discarded; others, about which nothing is known, are thoroughly investigated. Sufficiently important to merit singling out here are two factors — human relations and economic aspects — which frequently head the entire list.

5. Combining all of the pertinent factors of each part to give the answer to the problem.
6. Synthesizing the component parts to obtain the original problem. There's a good chance that one or more of the factors you have omitted will have more of an effect on the solution than your evaluation indicates. Therefore by performing your work in reverse, that is, by setting up a problem which involves only those factors which you have used in the solution of the original problem, you will have a check on your work, provided the problem obtained by this synthesis agrees substantially with the original problem.
7. Successively re-examining the problem to try to find a better solution. Because most problems in engineering are complex ones, a precise answer like that obtained in the solution of mathematical problems is usually not possible. This fact has given rise to the familiar "cut and try" or empirical method of the engineer which is embodied in this step.

From this statement of the engineer's methods, you can easily see that he not only thinks analytically but also works systematically. In fact, it is this organized attack, together with the engineer's mental integrity, which is the outstanding characteristic of engineering.

Knowing now what the professional engineer is and in a general way how he works, you are undoubtedly already aware of several additional items of information that you need in order to complete your picture of the engineering profession. A few of these — the personal characteristics of an engineer, a classification of the types of jobs performed by the engineer, and the educational requirements of an engineer — we can give you here. Many others, including information on the methods of applying practical knowledge in the field, you will need to get from some other source — preferably from an experienced engineer.

## WHAT KIND OF PERSON IS AN ENGINEER?

In any attempt to give you a list of personal characteristics, the problem immediately arises: What constitutes a "typical" engineer? Many vocational guidance organizations will give you a series of tests to determine your "personality profile" and, in making a recommendation to you, will compare your profile to that of an "average" engineer. The

*The Time and Motion Study laboratory*

trouble is there is no such thing as an average engineer. As you will see from the classifications of engineering jobs, two engineers may be performing duties which cannot be compared to each other any more than surgery can to farming. The habit of overlooking such differences has probably been responsible for many popular, but incorrect, ideas like the belief that all engineers are introverts. As a matter of fact, most men holding engineering jobs in administration or sales are predominantly extroverts. Engineers as a group probably have each of these qualities in almost the same ratios as the general population.

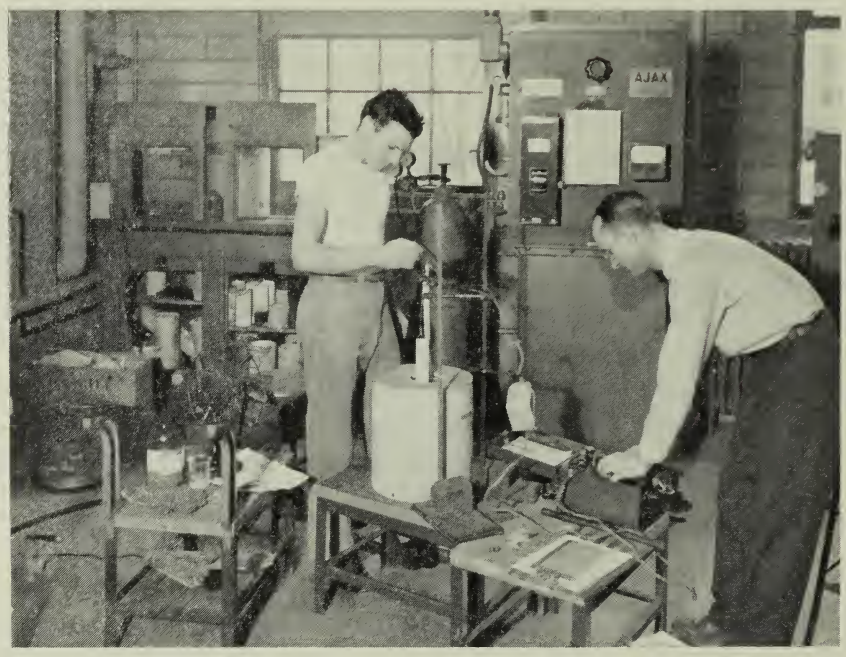
A few characteristics are common among successful men in any field; needless to say they are indispensable to the engineer:

1. A willingness to work hard throughout life
2. The hardihood to persist and endure
3. An abiding honesty in thought when dealing with facts and in action when dealing with men
4. The ability to cooperate with others
5. The capacity to assume leadership

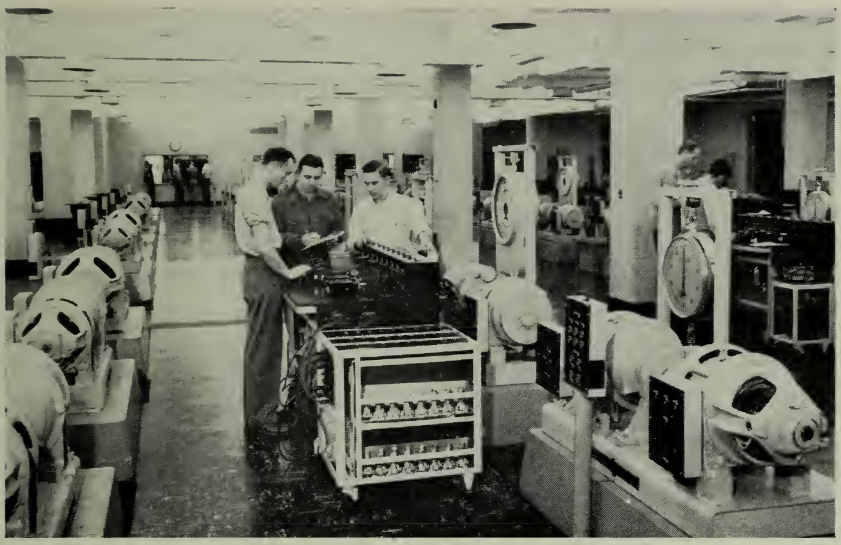
In addition to these universal characteristics the successful professional engineer possesses several other qualities. Since the engineering profession is a mental occupation in contrast to a manual one, the following traits are largely mental:

1. A genuine interest in mathematical analysis, design, research, development, etc.
2. An unfailing desire to know the underlying and basic truths about natural phenomena
3. Ability to weigh ideas and to make wise decisions
4. The ability to think logically
5. The imagination to set up mental pictures
6. The skill necessary to devise ingenious equipment and create ideas

This does not mean that every successful engineer has to possess every one of these traits. Because of the great variety in engineering jobs, an engineer will need to possess these characteristics in varying amounts depending upon the exact nature of his particular job. On the other hand, many characteristics necessary for success in specialized engineering jobs have not been included. For the most part the traits peculiar to a special job will be fairly apparent when you investigate that job. The list does give a general idea, however, of those qualities necessary for success in most engineering work.




*High-frequency induction equipment for melting metals and alloys*



*The Electrical Machinery laboratory can accommodate ten classes at a time*

To find out whether you have some of these qualities, try asking yourself the following questions:

1. Do I like puzzles such as mechanical puzzles, crossword puzzles, jigsaw puzzles, and mathematical puzzles?
2. Do I want to know why things happen the way they do?
3. Do I accept the first meaning of a sentence or paragraph that occurs to me, or do I read it over to see if it might have another meaning?
4. Do I like mathematics and do the reasons given in a mathematical proof seem convincing?
5. Do I have imagination; that is, can I set up mental pictures of things I have not seen from a description of them?
6. Am I ingenious in devising ways of making pieces of equipment work or finding a novel method of solving a problem?

## KINDS OF ENGINEERING JOBS

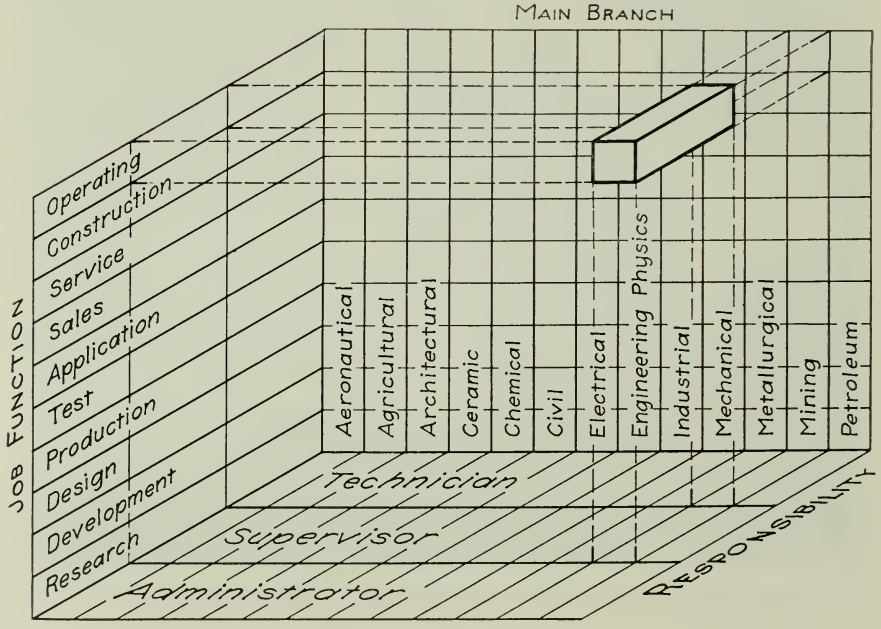
As you have seen, success in the engineering profession requires not only that you have certain personal characteristics which are common to all members of the profession but also that you either possess or develop additional traits which will be determined by the nature of the job you

enter. This brings us to the problem of classifying and describing various types of engineering jobs. To give you an idea of the relationship among the engineering jobs, our presentation consists of three related methods of classification.

In the first place, engineering jobs are classified according to the main branches which are recognized in industry. Secondly, they are described on the basis of the functions of the various jobs performed by engineers regardless of what branch they're in. And finally, they are discussed on the basis of the degrees of responsibility which can be associated with most of the jobs classified by the first two methods.

The relationship among these methods of classification can be seen readily from the accompanying chart. This chart is a three-dimensional graph, with the three methods of classifying engineering jobs — main branch, function, and responsibility — shown along the axes of the graph. The main branches are arranged alphabetically; the job functions in the order in which a new product is usually processed; and the responsibility in the order of amount. The particular job illustrated in the chart is that of an operating mining engineer in a supervisory capacity.

Two words of caution about interpreting this chart: First, many of the job functions listed along the vertical axis imply a certain level of responsibility; a product engineer, for example, must be at least at the super-



visory level of responsibility. Second, the chart is based only on the jobs found in those industrial organizations in which you as an engineer would ordinarily expect to find employment. In other words, the chart doesn't give the complete picture, because it doesn't include any of the engineering jobs which cross over into other careers. For example, some engineers take courses in education to become teachers of technical subjects; others study journalism to become technical writers and editors; still others study law to become patent attorneys. In the following description of engineering jobs, these specialized fields are not discussed; but don't overlook them.

### Classification by Engineering Branches

In the early days of man's history, engineering dealt exclusively with the construction of roads, bridges, forts, and other structures for military purposes. Later, as the need for such installations for nonmilitary uses became evident, a large group of engineers split away from the military to become "civil" engineers. After this, other groups of engineers split off into new branches, as scientific and technical knowledge was amassed beyond the capacity of any single individual to master it all. Recently the amount of accumulated technical knowledge has become so great that the individual engineer has to specialize in even more concentrated areas of knowledge than are represented by the main branches. These subdivisions are listed in the section on curricula (see pp. 42-67) as "options." However, the brief descriptions which follow concern only the main branches. They are based partly on the list of accredited curricula published in the Fifteenth Annual Report of the Engineers' Council for Professional Development.

1. *Aeronautical Engineering* involves primarily the application of scientific and engineering principles to the development and design of airframes and aircraft power plants. In a very general sense, the field may be subdivided into aerodynamics, structures, and propulsion. The complexity of aerodynamic and structural problems, which many times cannot be solved by mathematical methods alone, frequently necessitates experimental investigations. Thus, some aeronautical engineers are engaged in the design and development of equipment for experimental research; and, of course, many are concerned with its operation and the analysis of data obtained through its use. The best proof of any aircraft design comes from the analysis of full-scale flight tests; consequently many flight research groups are staffed with aeronautical engineers. The operation of transport and cargo aircraft is another scientific problem requiring the services of aeronautical engineers. In addition to investigating operational problems and handling engineering maintenance, the

aeronautical engineer proposes modifications to existing aircraft so that those designed in the future will perform with increased efficiency and safety. He is responsible for solving all technical problems encountered in designing aircraft ranging from the smallest personal airplane to the largest transport, from the slowest liaison craft to the supersonic airplane and missile, and from the present-day helicopter to the less conventional roadable aircraft and convertoplanes of the near future.

2. *Agricultural Engineering* deals with the solution of problems in the application of mechanical, electrical, and civil engineering to the farm. Such problems deal with the design and development of gasoline- and electrically-powered farm machinery and implements; farm buildings, including their arrangement and such functional requirements as lighting, heating, and ventilating; and such physical improvements as drainage, soil erosion control, flood control, land clearing, and irrigation.

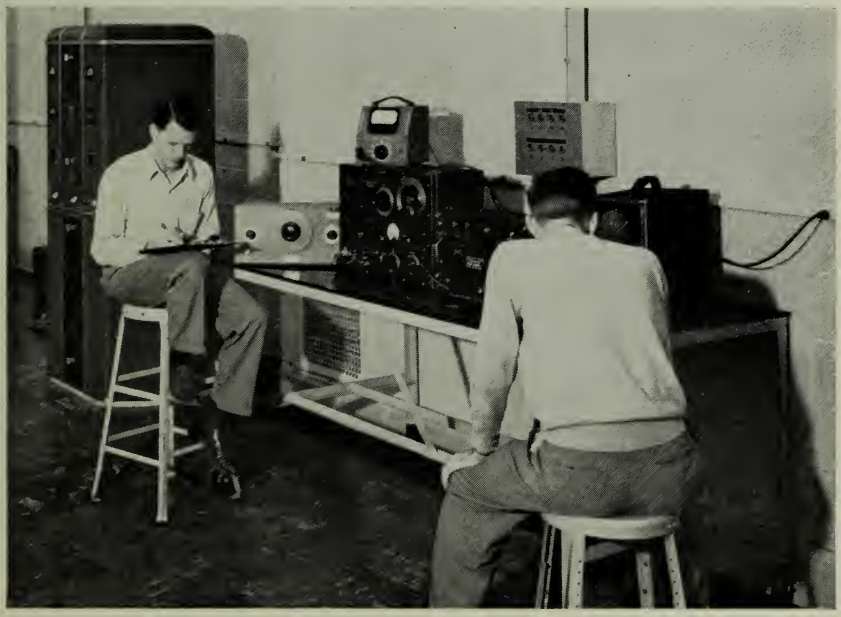
3. *Architectural Engineering* combines a knowledge of civil, electrical, and mechanical engineering with the principles of architecture. With this knowledge the architectural engineer designs and constructs complete buildings and structures, paying due technical regard to the choice of construction materials and methods, as well as the selection of the necessary electrical and mechanical equipment for the building. Throughout the entire process, he keeps foremost in his mind the esthetic quality not only of the over-all structure but also of each component, and its contribution to the complete picture.

4. *Ceramic Engineering,* closely allied to metallurgical engineering, concerns the processing and application of such nonmetallic minerals as glass, porcelain enamels, structural clay products, refractory materials, whitewares, pottery, abrasives, and cements. In connection with the operation of ceramic manufacturing processes, the ceramic engineer also utilizes his knowledge of electrical and mechanical engineering.

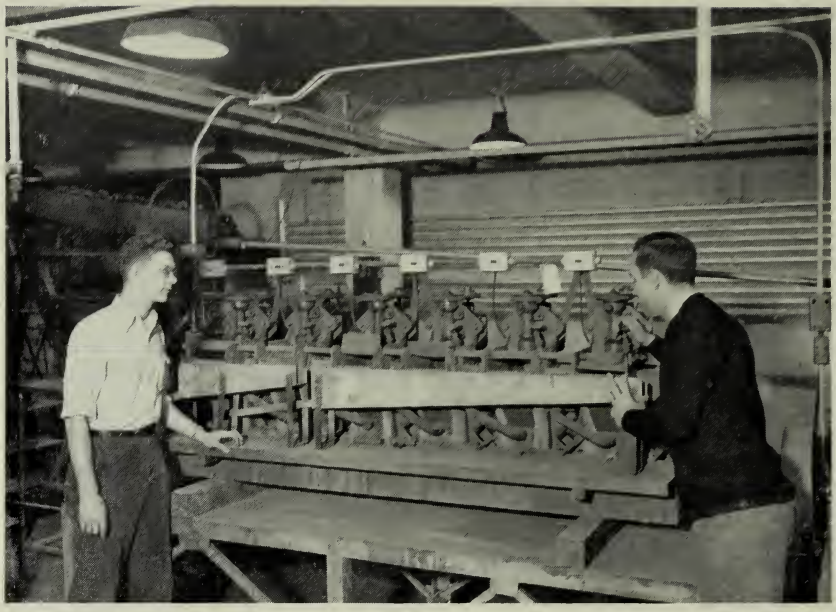
5. *Chemical Engineering* involves the development and application of manufacturing processes by which raw materials are changed in chemical composition and physical form for industrial and commercial use. The processes which bring about these changes have been separated by the chemical engineer into individual physical and chemical processes which are known as "unit" operations. A series of these unit operations are combined by the chemical engineer in the design and development of a complete manufacturing process. Some of the more familiar results of the chemical engineer's work are the production of fertilizers from nitrogen in the air, plastic materials from wood pulp and coal, aniline dyes also from coal, and high-octane gasolines from crude oil.

6. *Civil Engineering* is, as was mentioned previously, the oldest of the several branches. In addition the scope of civil engineering is one of the broadest. Traditionally dealing with the construction of roads, bridges, railroads, buildings, and other structures, the work of the civil engineer also includes the design and development of air fields, harbors, canals, dams, tunnels, and water and sewerage systems. In the performance of his work the civil engineer has to cope with all sorts of physical conditions, devise ingenious methods characteristic of engineering solutions, develop new construction materials with the help of chemical and metallurgical engineers, and create new machinery with the aid of mechanical and electrical engineers.

7. *Electrical Engineering* work concerns the problems of the generation, transmission, distribution, and utilization of electrical energy. Because of the widespread use of electrical energy both industrially and privately, the range of the jobs performed by electrical engineers is also very broad. The nature of his work extends from massive generators to household appliances, from high-powered radio and television transmitters to subminiature electronic devices, from problems of industrial illumination to the manufacture of small flashlight bulbs. As the particular applications overlap into other branches, so must the electrical engineer's knowledge be correspondingly extended.



*An experiment in the Radio Engineering laboratory*



*Flotation cells used in mineral dressing*

8. *Engineering Physics,* though not yet generally recognized in industry as a branch of engineering, is beginning to assume importance because of the recent developments in atomic energy. The physicist concerns himself primarily with research into physical phenomena and the laws governing them; the engineering physicist tackles the problem of utilizing these phenomena in industrial processes. He actually works in many of the branches listed here, just as the physicist does at the level of pure research. In the development of atomic energy, the engineering physicist worked right along with the physicist and the chemist in the design and development of manufacturing plants and equipment required for the process of nuclear fission.

9. *Industrial Engineering* is concerned essentially with the cost and production of goods according to a strict schedule, while other branches of engineering are concerned primarily with the function and quality of a product. It is a science of planning for manufacturing in the same way that the older branches of engineering are essentially a science of planning a design. It is concerned with coordinating men, materials, machines, and money to the end that a product of the quality specified by the designer can be produced at a minimum cost, and at a time desired by the consumer. It involves planning the organization, analyzing the product

design in terms of manufacturing procedures, selecting machinery, designing special tooling, determining the plant layout and materials handling methods, establishing the work methods and output standards, studying wage payment systems, and setting up methods of quality control. Industrial engineering has an application in any field of manufacturing, regardless of whether the product is metal, cloth, paper, or plastics. Because modern industry is highly mechanized, the industrial engineer must be essentially a mechanical engineer with background in management, economics, and accounting. Since the human element is a major factor affecting his plans, it is also desirable for him to have a good background in personnel management, psychology, and sociology.

10. *Mechanical Engineering* deals with the generation and transmission of power and the design, construction, operation, and testing of all kinds of machinery. Like the civil and electrical engineer, the mechanical engineer performs a great variety of jobs. In the transportation field alone he works with marine, railway, automotive, and aircraft equipment. In addition he works with equipment ranging from machine tools, engines, and turbines to refrigerators, air conditioners, and heating and ventilating plants. The knowledge needed by the mechanical engineer extends into related fields as the particular application demands.

*Optics laboratory for seniors and graduate students*

*One of the classes in General Engineering Drawing*

11. *Metallurgical Engineering,* closely allied with mining engineering, concerns the reduction or separation of metals from ores, the refining of the metals thus separated, and finally their preparation for industrial use. The metallurgical engineer utilizes his knowledge of chemistry in developing methods of metal separation and refining; he calls upon his mechanical knowledge to develop processes for working and shaping metals and alloys; and his knowledge of physics permits investigation into the nature, structure, and physical properties of metals and alloys, including their testing and heat treating.

12. *Mining Engineering* normally precedes metallurgical engineering in the sequence of finding and developing metallic and nonmetallic minerals from their ores. The mining engineer locates ore deposits, including those of metallic minerals and such nonmetallic minerals as coal and petroleum; he develops and operates the mines and wells needed to remove these minerals from the ground; and he gives the ores any preliminary treatment needed prior to refining. His job requires not only a good knowledge of engineering geology to locate the ore deposits and a knowledge of mechanical engineering to design and develop the necessary mining equipment but in addition a knowledge of several nontechnical subjects so that he can supervise the actual mining operation.

13. *Petroleum Engineering* involves the complete cycle of locating and extracting petroleum and refining and developing petroleum products. Sometimes treated as a division of chemical engineering, and less frequently as a division of mechanical engineering, petroleum engineering is more frequently classified as a separate branch. In the location and extraction of petroleum deposits the petroleum engineer utilizes his knowledge of geology and mining; in the development of equipment for the extraction and processing of petroleum he makes use of his knowledge of mechanical engineering; for the refining and development of petroleum products he resorts almost exclusively to his knowledge of chemistry.

### Classification by Job Function

The descriptions of each of the main branches in the preceding list attempt to give you only a general idea of the type of work performed. To accomplish this end it has been necessary to list a few typical functions for each branch. But you should understand that one man is not called on to perform all of these functions. As a matter of fact, any particular engineering job will probably consist of only one or two of these functions. In the course of your career, however, you will un-

*Experimental air conditioning equipment in the Mechanical Engineering Power laboratory*

*A class in Battery and Ignition Systems*

doubtedly perform several of them as you change jobs. Since many of the functions performed by engineers were omitted from the foregoing descriptions, they are described more completely in the following list. You should also understand that not all of the main branches contain every one of the job functions as listed here.

1. *Research Engineer.* As a research engineer your energies will be devoted to extending the horizons of knowledge. You must search and study the literature on a particular subject, make calculations to verify theory, and conduct experiments to prove, reject, or modify existing theories. As an engineer in *pure* research you will investigate physical laws for the purpose of increasing scientific knowledge, without being particularly concerned about the immediate application of your discoveries. In *applied* research your aims will be to solve specific manufacturing problems, to develop new equipment, and to discover new materials for which there is a need.

2. *Development Engineer.* In development engineering your work will consist mainly of taking the results and discoveries of research and developing them into useful methods, products, or apparatus. You will need to do a considerable amount of experimental and analytical work in order to get a product into its final form for production.

3. *Design Engineer.* If you decide to work as a design engineer, you will be responsible for the preparation of detailed plans and specifications from which a piece of apparatus is produced or a system is constructed. You will make the necessary calculations and sketches, write or supervise the writing of detailed specifications, select the needed materials and processes, help prepare the specifications for test procedure, and establish acceptable performance standards for the manufacture of equipment. To do this you will need to be analytically inclined and have the ability to visualize what happens during the operation of any piece of equipment. You must also keep up to date on the latest developments and patent situation in your field.

4. *Production Engineer.* You are responsible for the manufacture of products and apparatus from raw materials and designs if you become a production engineer. In this capacity you must analyze the methods, processes, and equipment used in the manufacturing operation. Giving due consideration to the economic aspect, you must work closely with the design engineer on manufacturing problems. In addition to having a good knowledge of engineering and manufacturing procedures, you must also be informed about the principles of industrial management and the problems of human relations that go with it.

5. *Test Engineer.* As a test engineer you will be in direct charge of the actual testing of apparatus and equipment to find out whether it meets specifications and accepted engineering standards. It will be your job to see to it that the correct and standard test methods are safely applied. You probably will often consult with the design engineer on special testing problems and on the development of cheaper and improved methods of testing.

6. *Application Engineer.* If you work as an application engineer you will be concerned with problems involving complete plants and systems. You will be expected to recommend specific equipment and coordinate the engineering requirements of the entire installation. Normally you will have to confer with the design engineer to inform him of the characteristics which each piece of apparatus in the system should have. In a manufacturing company you will also be expected to act as a consultant to the sales department in order to help select the specialized equipment which will best serve the customer's needs.

7. *Sales Engineer.* In sales engineering you will work directly with the customer as the manufacturer's sales and engineering representative. As in any sales work, you will need to study your customer's needs. You will also need to know thoroughly the equipment you are selling, so that you can explain its design, construction, and operating features to the

customer. Ordinarily you will be responsible for arranging the delivery date of the equipment and occasionally for negotiating its sales price. In addition to your technical training, you will need the type of personality that inspires confidence and the ability to work with people.

8. *Service Engineer.* If you decide to work as a service engineer you will supervise the installation of new apparatus and perform the final tests. You will investigate customer complaints and correct any trouble the equipment may be giving the customer. In many cases the difficulties may be important enough to require that you restore operations as soon as possible — even under emergency conditions. Since your work will cover a broad field in widely varying situations, you will need a good, broad engineering knowledge along with plenty of ingenuity at times. Because service engineering necessitates dealing with the customer, many companies combine service and sales engineering into a single job.

9. *Construction Engineer.* Even though you do not directly enter the field of civil engineering, as a construction engineer you may be called upon to perform similar services in your own field by supervising the construction of facilities and structures from the designs and plans. In this work you will need to be familiar not only with the technical problems as they apply to your particular field but also with the problems specifically associated with all construction work — namely, the procurement of materials, the selection and proper use of equipment, and the handling of men. The ability to work with others and direct their efforts is as important to the construction engineer as is his technical background.

10. *Operating Engineer.* If you decide to work as an operating engineer you will be charged with the responsibility of operating part or all of an enterprise safely, efficiently, and without interruption. You may work with a group of machines, a plant, or a system. You will supervise the procurement of supplies and repair parts, the protection and maintenance of the equipment, the selection of new equipment, and the direction of operating personnel. In case of a breakdown or an emergency you must have the ingenuity and resourcefulness to restore full operation, frequently under the most difficult conditions. Like the construction engineer you must have a broad engineering background and be able to handle men.

The foregoing list is based not on the importance of the functions described but rather on the order in which a new discovery is handled until it has been made useful to man. You should realize that not all of these classifications occur in every one of the branches and that in many instances two or more of these functions are combined into a single job.

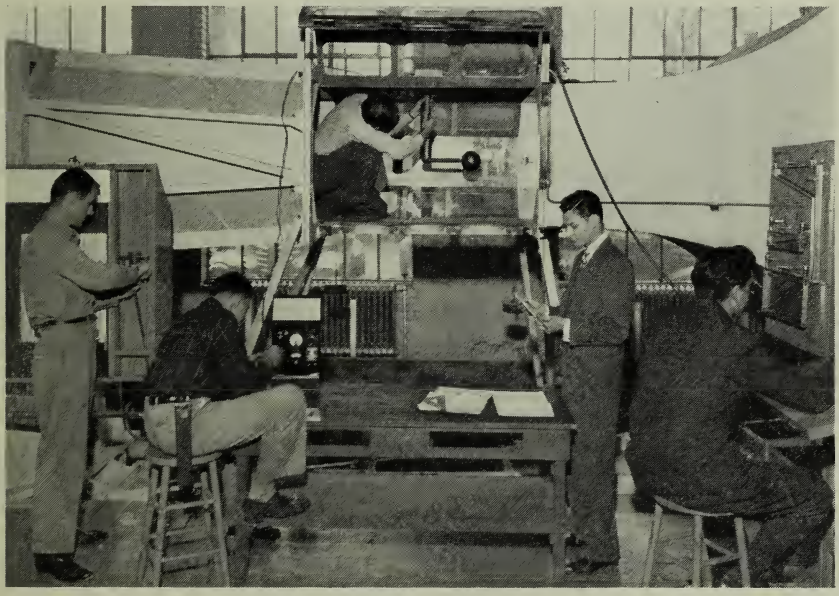
### Classification by Responsibility

The third and final way of classifying engineering jobs is based on the amount of responsibility required for the job. Again, not every one of the following levels exists for each of the functions just classified.

1. *Technical Work.* The first type of job you encounter as an engineer consists of work at the technical level and demands a minimum of responsibility on your part. You solve technical problems under the general supervision of someone else who determines what problem is to be attacked and when a satisfactory solution has been reached.

2. *Supervisory Work.* The next type, which you can attain only after having proven your ability, consists of work at the supervisory level. You assign problems to other engineers and direct their work. In this capacity you are responsible for the proper operation of a group or a department in an organization.

3. *Administrative Work.* The maximum amount of responsibility you can assume, but only if you have superior ability and experience, consists of work at the administrative level. In such a capacity you are concerned with the broader aspects of the operation of your company. These include such problems as general policy, organization and coordi-



*An Aeronautical Engineering class working with the small wind tunnel*

nation, personnel, finance, law, and public relations. Many engineers hold administrative positions, especially in engineering industries.

## KIND OF EDUCATION NEEDED

Since engineering is essentially a mental occupation, the education of engineers aims principally at developing mental ability. This goal is not reached overnight. As a matter of fact, the real educational process once begun never ceases. In general, engineers gain their formal education on three distinct levels: (1) high school, (2) college or university, and (3) post-college industrial organizations.

At the high school or "pre-engineering" level you should begin to think about whether you want to aim toward the engineering profession. For this reason it has been recommended that you perform a preliminary analysis of yourself while you are still in high school. In order to give you a good foundation for more advanced work at the college level, your high school studies should achieve:

1. A complete mastery of the principles of arithmetic, algebra, plane and solid geometry, and trigonometry (merely being "exposed" to these courses is not sufficient)
2. A thorough understanding of physics and chemistry
3. A good background in English, economics, and government which will enable you to understand better the society in which you live, and give you a solid foundation on which to develop the ability to use the "engineering method" in solving problems
4. A firmly entrenched knowledge of the material you have already studied, and your own development as a superior student

Unfortunately too many high school students are coming to college with a deficient background in mathematics, physics, and chemistry. Large numbers of prospective engineering students are graduating from high school with too great a percentage of their courses in shop work and far too little training in the physical and social sciences. The person who suffers from this deficiency or is a poor student will have considerable trouble in meeting the scholastic standards of a university or college.

The second or college level of an engineering education is that with which you will be most directly concerned in the near future. You should realize that your graduation from college does not make you a finished engineer. You will have, however, the foundation on which you can build your career through experience and continued study.

In fact, this foundation resulting from college training is so important to your development as an engineer that you must thoroughly

understand and appreciate the objectives of your college work. Fundamentally these objectives are to gain knowledge, to develop the mental skills necessary to utilize this knowledge, and to develop the proper attitudes and personal characteristics which enable you to become a successful engineer and a good citizen. A clearer picture of these objectives is presented in the following outline.

### OBJECTIVES OF THE ENGINEER'S COLLEGE TRAINING

I. To Gain Knowledge
   - A. Fundamental laws and principles
   - B. Factual engineering information
   - C. Cultural, sociological, and economic background

II. To Develop Mental Skills
   - A. Facility to express yourself both by words and by graphic devices
   - B. Facility to visualize and comprehend
   - C. Imagination, ingenuity, and resourcefulness
   - D. Ability not only to find sources of information but also to discriminate between pertinent and immaterial information
   - E. Ability to think straight, to reason logically from fundamental principles, and to reach correct conclusions
   - F. Ability to analyze, evaluate, and synthesize (the "engineering method")

III. To Develop Proper Attitudes and Personal Characteristics
   - A. Honesty with facts and men
   - B. Realization of your citizenship responsibilities
   - C. Spirit of cooperation with others in a common endeavor
   - D. Leadership
   - E. Industry, initiative, and self-reliance
   - F. Confidence in your ability to learn and to carry on individual studies, investigations, or researches

The actual achievement of these objectives is accomplished in several different ways. The first group and parts A and B of the second are gained largely through your scholastic work. Parts C through F of the second objective and the development of many of the attitudes you need are acquired not so much by the subject matter taught in your courses as by the mental freedom which the method of teaching permits you.

The last objective concerns not only the development of personal characteristics necessary for a successful career but, in addition, the

*A surveying party at the summer camp*

development of those personal and social traits that contribute to a pleasing personality. As in the development of mental skills, the achievement of both types of personal characteristics requires your own initiative and earnest effort. Although the first group can be improved in part through your academic work, you will find that a good personality can be developed better by association with your fellow students than by formal education. You should take advantage of the opportunities to improve yourself socially by attending parties, church activities, banquets, and dances and by participating in the group meetings and student activities which are described in the next section.

This recommendation for your social improvement is stressed here because in the past engineers have often been justly accused of having no social consciousness. Although this deficiency is being remedied more rapidly than many people realize, the engineering student often becomes so engrossed in his academic work that he tends to put off participation in social activities until after graduation, when he thinks he will have more time. Obviously such procrastination only leads into a vicious circle.

Of course, we do not advocate that you become a social butterfly. If you are like most engineering students, however, such a possibility

is quite remote, which is the reason for our advising you to go "all out" in the development of social contacts.

A final word about your college education, before going on to discuss the post-college phase of your formal education. During the last two years of each engineering curriculum, provisions have been made for several hours of elective courses. The object is to permit you to broaden your training along whatever lines you desire. Therefore instead of regarding these elective courses as a necessary evil in your curriculum, as do many engineering students, you should select each elective to fit into a common purpose. A few of these goals are indicated in the following list:

1. To develop your cultural background
   Subjects which accomplish this purpose are literature and the fine arts, history, astronomy, languages, etc.
2. To develop your sociological background
   Subjects that do this include social psychology, sociology, history, economics, political science, geography, etc.
3. To develop a hobby for recreation
   Subjects in this group can be selected from anything that you are interested in — astronomy, archeology, zoology, botany, literature, music, dramatics, etc.
4. To provide knowledge in subjects related to professional work
   This group consists largely of isolated courses like economics, accounting, psychology, industrial relations, engineering law, engineering report writing, speech, business letter writing, etc.
5. To develop a combination of engineering and another career
   To accomplish this purpose most of your electives should be selected from a single area like business administration, education, law, journalism, political science, etc.

The third and final phase of your engineering education is acquired in industry after you graduate. Many organizations have formal, post-college training courses which are conducted under any one of several plans. In one plan the course runs for a period of a year. In another the formal training is sandwiched in with your regular work; the time is usually extended — sometimes up to five years. Other plans may consist of any combination of these extremes, but in any event most large companies also offer refresher courses which you are encouraged to take periodically.

Even though this last phase of your formal education may cease in one to five years, your education in the true sense never stops. Real education comes from the inside; you educate yourself. Contrary to the

belief of many people, education does not mean "the pouring of knowledge into," but rather "'the leading out of' a state of mental confusion due to lack of knowledge." In the primary schools and in many secondary ones this "leading out of" is done for you by your teachers. In college, and to a still greater degree in your first industrial experience, you take over. You lead yourself out of mental confusion, with only such assistance from your instructors or supervisors as is needed to help you develop this ability. And throughout the rest of your career, your further education lies in your own hands. Except perhaps in those companies that tacitly require you to attend refresher courses, this also means that you are responsible for your own impetus.

Now you have most of the information you need about the basic nature of engineering and of the engineer. The last section of this booklet describes the facilities available at the University of Illinois which help to achieve the educational objectives we have just discussed.

*Main entrance of the Summer Surveying Camp in northwestern Minnesota*

## III. GAINING AN EDUCATION AT ILLINOIS

Two of the goals we've said that you want to reach are *gaining knowledge* and *developing mental skills.* These alone may be of fairly little use in the modern world. You need also to make friends, inspire confidence among the men and women you work with, and play your part as an effective citizen of a democracy.

Most people gain knowledge best by going to classes and laboratories, making inspection trips, and studying textbooks. They develop mental skills best if instructors teach in a way that allows them mental freedom and stimulates individual thinking.

Naturally, educators differ somewhat in their ideas about what you should learn from classes and labs and trips and books, and about how you can best be taught. But since the founding of the University of Illinois in 1868, the basic decisions about what and how you should learn haven't changed very much. One of those decisions was that courses and methods should develop with the times, to give each generation of students the background they need. Let's look a little at history to see how the University has always held to its basic decision and yet has been able to change quickly to meet the changing requirements of industry.

At first the University of Illinois was called "The Illinois Industrial University," and the College of Engineering was called the "Polytechnic Division." This Division offered four courses of study — (1) mechanical science and art, (2) civil engineering, (3) mining engineering and metallurgy, and (4) architecture and fine arts. For the first two years you could have chosen any course you wanted. But in 1870, with the establishment of the College of Engineering, your teachers would have "recommended" definite programs of study to you. A little later these recommended programs became "required." About 1915 the college began requiring a four-year course of study leading to a degree, and gave it the name "Curriculum."

### THE PIONEERS

Foremost among the men responsible for making the basic decision in the early years — the decision which has stood the test of time — was Stillman W. Robinson, the first teacher in the new college. Appointed professor of mechanical engineering in 1869, he proposed a plan setting

up the first purely educational shop in the United States. Under this plan, engineering students not only attended the shop course while they were in school, but in addition kept "vacation journals and memoirs." These were notebooks in which they sketched and wrote about unusual mechanisms they saw on visits to industrial plants during the summer vacation. Back at college in the fall, they would discuss in class what was in their notebooks. The aim was to relate the mathematical and scientific knowledge they got in college with what was actually going on in industrial practice.

Professor Robinson was associated with and followed by a group of pioneers in this almost new type of education. Among them were Professors Selim H. Peabody, in mechanical engineering, later elected regent (president) of the University; J. Burkitt Webb and Ira O. Baker, in civil engineering; N. Clifford Ricker, in architecture; Arthur T. Woods and Lester P. Breckenridge, in mechanical engineering; Arthur N. Talbot, in municipal and sanitary engineering; Theodore B. Comstock, in mining engineering; and Samuel W. Stratton and Albert P. Carman, in physics.

*A demonstration in the Illumination Engineering laboratory*

*Testing an aluminum alloy to determine its strength*

Their influence persists to this day in engineering institutions and in professional practice.

During the 1870's and 1880's minor changes and revisions were made in the courses of study. In 1889 the first major development came with the establishment of the physics department in the College of Engineering. A year later the department of theoretical and applied mechanics was founded, and a course in electrical engineering was offered in the mechanical engineering department. In 1891 electrical engineering was transferred to the physics department, and two new courses — architectural engineering, and municipal and sanitary engineering — were offered. Two years later the mining engineering department was discontinued.

In 1898 a separate department of electrical engineering and a course in railway mechanical engineering were set up. Since the civil engineering department was already providing instruction in railroad building and maintenance, the new course stressed the design and operation of locomotives and rolling stock. In 1898 also, the semester system was adopted; it replaced the term system with its three unequal periods of 14, 12, and 18 weeks.

In 1905 a course in ceramics and ceramic engineering was offered by the College of Science; ten years later it was transferred to the College

of Engineering. During 1907 the railway engineering department was organized to incorporate the three curricula in civil, mechanical, and electrical railway engineering. The mining engineering department was re-established in 1909, and in the same year the holding of weekly lectures by prominent teachers and practicing engineers was introduced. All freshman engineers attended in order to learn about professional practice and ethics.

## THE COLLEGE MAKES SOME MAJOR CHANGES

During the years 1910-15, in keeping with the trend started by the freshman lecture program and on account of the College's rapid development, Dean Goss recommended a major review of all courses and policies. In 1911 a faculty committee was formed to conduct this survey and make recommendations for any necessary changes.

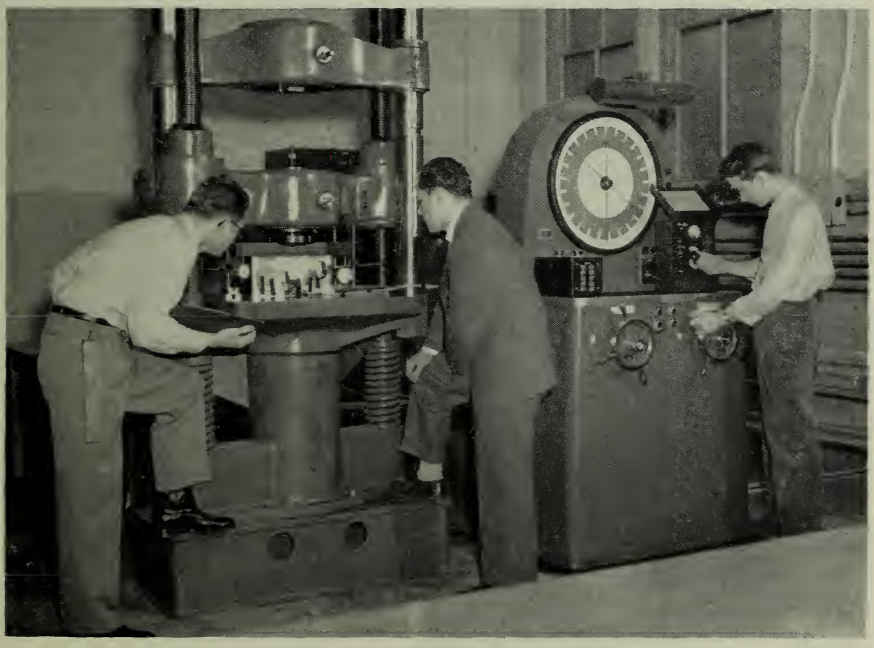
Five major actions were taken:

1. The total number of semester hours required for graduation was left unchanged.
2. The thesis which previously was required for graduation was made optional, because there were not enough facilities to provide the necessary individual instruction for the much larger student body.
3. The proportion of time spent on each of the following main groups of studies was recommended to be:
   a) Language and general cultural subjects — 25 per cent
   b) Mathematics, pure and applied, including all technical subjects strongly mathematical in nature — 45 per cent
   c) Technical laboratory, drafting, surveying, etc., and all other subjects that do not require extensive preparation outside of class — 30 per cent
   d) Technical courses, largely informational in character, and less closely related than others to the specialized purpose of the curriculum — the time devoted to these courses was small enough to be neglected
4. Several specific subjects were changed and rearranged, and the hours of laboratory work were cut down to permit the inclusion of nine hours of nontechnical electives. This change was aimed at giving the engineering student an opportunity to broaden his education and outlook.
5. Engineering students were required to have credit in the basic writing courses before they could attain junior standing. In addition, students who used poor written and oral English had to

improve themselves by taking additional courses without credit. This plan was so well received that it was adopted throughout the University.

Two other developments date from the same period. In 1913, the shop courses were completely revised: to Professor Robinson's manual methods were added procedures leading the student to investigate how efficiently processes, methods, and equipment worked, in addition to making them work. This was a big change — the first of its kind in American engineering schools. From it have evolved the present laboratory courses. The second important development was the senior inspection trip. Each year since about 1900, seniors had been spending three or four days, at their own expense but under the guidance of faculty members, visiting industries in Illinois and neighboring states. This was a valuable and popular activity. In 1915, therefore, the College made this senior inspection trip a requirement for graduation.

Though this era of momentous changes in policy and program was by no means the only one in the history of the College, it has been described in detail to give an idea of what kind of thinking has gone into



*Compression test of a stiffened panel in the Aircraft Structures laboratory*

making an educational program that best fits your needs. In addition, the scope of these changes is typical of what has to be done in these days of rapid industrial progress and technological advancement if you are to get the most out of your engineering education.

Lack of space forbids an equally detailed discussion of developments during the past thirty-five years. We shall hit only the highlights, with stress mainly on changes in departments and curricula. Therefore, little if any mention will be made of the many "options" that have been added to various curricula from time to time.

## RECENT MAJOR DEVELOPMENTS

The curriculum in engineering physics was introduced by the physics department in 1917. In 1922 the language requirements for admission to the College were changed and the nontechnical electives were reduced from nine to six hours. A curriculum in gas engineering was also offered in 1922; it was discontinued ten years later. The year 1923 brought the introduction of the general engineering curriculum, administered directly by the College. In 1925 the municipal and sanitary engineering department was discontinued, but most of its courses were transferred to the civil engineering department as an option in sanitary engineering.

During the early thirties, three major departmental changes were made. In 1931 the architecture department was transferred from the College of Engineering to the newly established College of Fine and Applied Arts. In 1933 the department of agricultural engineering was set up. And in 1934 the curriculum in metallurgy was changed to the curriculum in metallurgical engineering.

In the final period of the College's history the department of railway engineering was discontinued (1940), and its three curricula were again taken over by the departments of civil, electrical, and mechanical engineering. In the next year, all freshman engineers were required to follow the same program, so that they would get the chance to become familiar with the various branches in engineering before having to choose one of them. At the recommendation of the State Department of Public Health, the civil engineering department in 1942 offered a five-year curriculum in public health engineering. For the first four years it parallels the regular sanitary engineering option; in the fifth year it includes work in the College of Medicine. Lastly, in 1944 the aeronautical engineering department, separate from previous aeronautical training under civil engineering, was set up.

*Ceramic Materials laboratory — examination and testing of raw materials, bodies, and glazes*

The year 1949-50 saw the appointment of many committees — several of them working with groups outside the College of Engineering — whose purpose was to appraise the operation of the College in view of the drastic educational and social changes brought about by World War II and the postwar period. Most of these committees have made recommendations that are now in effect or under study. Some of the recommendations are embodied in this pamphlet.

## MEETING YOUR NEEDS

This brief survey of the principal developments in the College of Engineering makes clear the fact that planning an educational program for engineering students isn't an easy job. Minor changes have been numerous; major changes were made on four occasions. The reasons are plain after a moment's thought. For instance, there are always two considerations that are at loggerheads when a program for engineering education is being designed. On the one hand, there is the realization that the more scientific and technological progress there is, the greater the number of technical courses that seem necessary. On the other hand, there is the equally sharp realization that the more complicated society becomes, the broader an engineer's training should be and the more freedom he should have to study nonengineering subjects.

## THE COMMON PROGRAM FOR FRESHMEN

To gain an overview of engineering fundamentals before the student makes his final choice of a particular branch, all freshmen in the College of Engineering take the same program except for the few differences indicated in the curricula outlined on the following pages.

First, however, a few words about the administration of some of the curricula:

For certain important purposes, the Department of Agricultural Engineering is a unit in the College of Agriculture. Its curricula, however, are administered by the College of Engineering, and its Head serves on the Executive Committee of the College of Engineering.

The curricula in chemical engineering are administered, as a division of the Department of Chemistry, by the College of Liberal Arts and Sciences, but the head of that division serves on the Executive Committee of the College of Engineering.

The general engineering curriculum is administered directly by the College of Engineering.

The curriculum in sanitary engineering is administered by the Department of Civil Engineering.

The same department administers the curriculum in public health engineering jointly with the College of Medicine.

The group of nontechnical electives known collectively as "Engineering Courses" is administered directly by the College of Engineering.

### Common Program for Freshmen

#### First Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 102 or 103—General Chemistry | 3 or 4 | Chem. 104—Chemistry of the Metallic Elements | 4 |
| G.E.D. 101—Elements of Drawing, or G.E.D. 104—Advanced Drawing | 4 | G.E.D. 102—Descriptive Geometry | 4 |
| Math. 112[1]—College Algebra | 3 | Math. 122—Analytic Geometry | 4 |
| Math. 114[1] or 115—Plane or Advanced Trigonometry | 2 | Rhet. 102—Rhetoric and Composition | 3 |
| Rhet. 101—Rhetoric and Composition | 3 | Hygiene 101 | 2 |
| Eng. 100—Engineering Lecture | 0 | Eng. 100—Engineering Lecture | 0 |
| Physical Education | 1 | Physical Education | 1 |
| Military (men) | 1 | Military (men) | 1 |
| *Total* | 17 or 18 | *Total* | 19 |

[1] Students entering college with two units of algebra and one-half unit of trigonometry will register in Math. 123, Analytic Geometry, five hours credit, depending upon the results of placement tests taken during Freshman Week.

### N.R.O.T.C. Students in Engineering

It takes nine semesters to complete the requirements for a Bachelor of Science degree in any curriculum of the college in the N.R.O.T.C. program. The first two semesters are common to all curricula as stated below. The other seven are completely worked out and are on file in the college office and in each department offering a curriculum in the program.

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| G.E.D. 101—Elements of Drawing, or G.E.D. 104—Advanced Drawing | 4 | Chem. 102 or 103—General Chemistry | 3 or 4 |
| Math. 112[1]—College Algebra | 3 | Math. 122—Analytic Geometry | 4 |
| Math. 114[1] or 115—Plane or Advanced Trigonometry | 2 | Rhet. 102—Rhetoric and Composition | 3 |
| Rhet. 101—Rhetoric and Composition | 3 | Hygiene 101—Personal and Environmental Hygiene | 2 |
| N.S. 100—Ordnance and Communication | 0 | N.S. 100—Ordnance and Communication | 0 |
| N.S. 111—Naval Orientation | 3 | N.S. 112—History of Sea Power | 3 |
| Eng. 100—Engineering Lecture | 0 | Eng. 100—Engineering Lecture | 0 |
| Physical Education | 1 | Physical Education | 1 |
| *Total* | 16 | *Total* | 16 or 17 |

[1] Students entering college with two units of algebra and one-half unit of trigonometry will register in Math. 123, Analytic Geometry, five hours credit, depending upon the results of placement tests taken during Freshman Week.

## ELECTIVES

Nontechnical electives for students in the College of Engineering include all courses offered in the College of Liberal Arts and Sciences and in the College of Commerce and Business Administration; the general courses in the College of Education; courses numbered 100 through 123 in the School of Music; Art 111, 112, and 115; Landscape Architecture 111 and 164; and the seven courses in Engineering numbered 140, 141, 216, 220, 230, 239, and 292. Field survey courses may be used in place of the nontechnical and approved electives in any curriculum, with some reduction in credit. Students electing the third and fourth years of military training and those taking naval science courses may count the credit they receive in place of approved and nontechnical electives to an amount equal to the total of these electives stated in each curriculum.

Technical electives include all courses in the College of Engineering not required in the student's curriculum, excepting General Engineering Drawing 101, 102, 104, 106, 107, and 108, and Engineering 140, 141, 216, 220, 230, 239, and 292.

Approved electives include all technical and nontechnical electives as defined above and any other courses designated as approved electives in the outlines of curricula.

Departmental electives and technical options are restricted to courses of a technical character as listed under this classification by each department.

Some restrictions are placed on the foregoing general definitions of electives in certain departments. These are noted at appropriate places by footnotes to the curricula.

## ENGINEERING COURSES

Besides the curricula and courses discussed on the following pages the College of Engineering offers a number of so-called Engineering Courses that may be taken as nontechnical electives in all engineering curricula. These courses, which cut across departmental lines, are as follows:

Engineering 140 — Transportation Development
Engineering 141 — Transportation Problems
Engineering 216 — Presentation of Engineering Information
Engineering 220 — History of Engineering
Engineering 230 — Labor Relations
Engineering 239 — Industrial Relations
Engineering 292 — Engineering Law

## THE ENGINEERING CURRICULA

### Aeronautical Engineering

This curriculum gives training in the fundamental principles of airframe and aircraft power plant design and construction. Since the present rapid development of the aircraft industry provides many good opportunities for graduates, every effort is made to offer courses that give the fundamental knowledge necessary for an understanding of the engineering principles on which these rapid advances are based. Instruction in supersonic aerodynamics and reaction type engines is an example of work offered to you in an area of current and future importance. The required courses in the curriculum prepare you for any of the several technical divisions of the aircraft industry; the elective courses permit study in the fields of airplane design, aircraft power plant design, aircraft production and maintenance engineering, and air line engineering. Although a high degree of specialization in your undergraduate program is not recommended, you can take some advanced undergraduate courses in the general areas of aerodynamics, structures, and propulsion. Graduate study and research is available in all these divisions of the field.

## Curriculum in Aeronautical Engineering

*For the Degree of Bachelor of Science in Aeronautical Engineering*

### First Year

Common Program for Freshmen (page 42)

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| G.E.D. 103—Aircraft Drafting and Lofting | 3 | Math. 142—Calculus | 3 |
| Math. 132—Calculus | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| M.E. 182—Manufacturing Processes | 3 | T.A.M. 156—Analytical Mechanics (Statics and Dynamics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physical Education | 1 |
| Physical Education | 1 | Military (men) | 1 |
| Military (men) | 1 | Non-technical Electives[1] | 3 |
| *Total* | 18 | *Total* | 18 |

### Third Year

| | | | |
|---|---|---|---|
| Aero. E. 201—Aircraft Materials and Processes | 3 | Aero. E. 212—Introduction to Aerodynamics of Real Fluids | 3 |
| Aero. E. 211—Aerodynamics | 3 | Aero. E. 220—Aircraft Structures | 3 |
| Math. 345—Differential Equations and Orthogonal Functions[2] | 3 | E.E. 202—Direct and Alternating Current Circuits and Machines | 2 |
| M.E. 205—Thermodynamics | 3 | E.E. 203—Direct and Alternating Current Circuits and Machines Laboratory | 1 |
| T.A.M. 221—Resistance of Materials | 3 | M.E. 222—Mechanics of Machinery | 3 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | Approved Electives | 6 |
| Non-technical Electives[3] | 3 | | |
| *Total* | 19 | *Total* | 18 |

### Fourth Year

| | | | |
|---|---|---|---|
| Aero. E. 221—Aircraft Structures | 3 | Aero. E. 242—Airplane Design | 3 |
| Aero. E. 231—Aircraft Power Plants | 3 | Aero. E. 264—Aircraft Structures Laboratory | 2 |
| Aero. E. 241—Airplane Design | 3 | Aero. E. 262—Aircraft Engine Laboratory | 2 |
| Aero. E. 261—Aerodynamics Laboratory | 2 | Aero. E. 290—Seminar | 1 |
| Aero. E. 299—Inspection Trip | 0 | Eng. 292—Engineering Law | 3 |
| E.E. 217—Electrical Measurements | 3 | Approved Electives | 6 |
| Approved Electives | 3 | | |
| *Total* | 17 | *Total* | 17 |

[1] Speech 101 or Econ. 108 recommended.
[2] Math. 341 may be substituted.
[3] Eng. 216 recommended.

### Agricultural Engineering

Graduates from this curriculum enter teaching, research, and commercial and industrial work in agricultural engineering. Instruction is given under four main headings: (1) Power and machinery, including consideration of the types available and applicable to farm operation; the design of implements, machines, vehicles, and other equipment; and the

development and use of various suitable materials of construction. (2) Rural electrification, including study of the problems of providing electrical service to rural areas, and the development and use of the farm machinery and equipment involved in the extensive use of electricity in agriculture. (3) Farm buildings and housing, including design, location, and arrangement; functional requirements, lighting, heating, and ventilating of farm buildings; and provision for refrigeration equipment, water supplies, and sewage disposal. (4) Soil and water conservation, including drainage, soil erosion control, flood control, irrigation, land clearing, and physical improvements. Options are available in machinery and power, and in structures and conservation.

## Curriculum in Agricultural Engineering

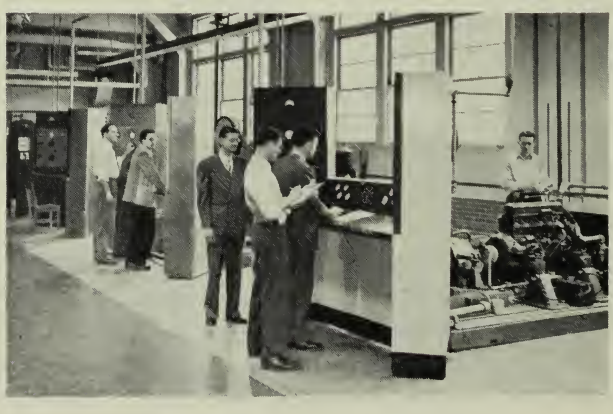
*For the Degree of Bachelor of Science in Agricultural Engineering*

### First Year

Common Program for Freshmen (page 42)

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Agr. Eng. 111—Farm Structures, and Soil and Water Conservation | 3 | Agr. Eng. 112—Tractors and Field Machinery | 3 |
| Bot. 100—General Botany | 4 | Agron. 121—Crop Production | 4 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military (men) | 1 | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 19 | *Total* | 19 |



*The Internal Combustion Engine laboratory*

## Third Year

### Machinery and Power Option

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Econ. 108—Elements of Economics | 3 | Agr. Econ. 120—Farm Management | 3 |
| Geol. 105—Agricultural Geology | 3 | Agron. 201—Soils | 5 |
| M.E. 221—Mechanics of Machinery | 5 | M.E. 183—Materials Casting | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | M.E. 202—Thermodynamics | 3 |
| T.A.M. 221—Resistance of Materials | 3 | M.E. 224—Design of Machine Elements | 3 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | | |
| *Total* | 18 | *Total* | 17 |

### Farm Structures, Soil and Water Conservation Option

| | | | |
|---|---|---|---|
| C.E. 115—General Surveying | 3 | Agr. Econ. 120—Farm Management | 3 |
| C.E. 235—Plain Concrete | 2 | Agr. Eng. 262—Farmstead and Home Equipment | 3 |
| Econ. 108—Elements of Economics | 3 | Agron. 201—Soils | 5 |
| Geol. 105—Agricultural Geology | 3 | C.E. 261—Structural Analysis | 4 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | T.A.M. 232—Fluid Mechanics | 3 |
| T.A.M. 221—Resistance of Materials | 3 | T.A.M. 234—Fluid Mechanics Laboratory | 1 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | | |
| *Total* | 18 | *Total* | 19 |

## Fourth Year

### Machinery and Power Option

| | | | |
|---|---|---|---|
| Agr. Eng. 341—Farm Power | 3 | Agr. Eng. 332—Design of Agricultural Machinery | 3 |
| Agr. Eng. 299—Inspection Trip | 0 | Agr. Eng. 393—Special Problems | 3 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 307—Direct and Alternating Current Circuits Laboratory | 1 | E.E. 309—Direct and Alternating Current Apparatus Laboratory | 1 |
| M.E. 184—Metal Processing | 3 | M.E. 234—Heat Treatment of Metals | 3 |
| M.E. 271—Design of Machine Elements | 3 | Approved Electives | 4 |
| Approved Electives | 4 | | |
| *Total* | 17 | *Total* | 17 |

### Farm Structures, Soil and Water Conservation Option

| | | | |
|---|---|---|---|
| Agr. Eng. 351—Hydraulics of Soil and Water Conservation | 3 | Agr. Eng. 393—Special Problems | 3 |
| Agr. Eng. 371—Advanced Farm Structures | 3 | C.E. 264—Structural Design | 5 |
| Agr. Eng. 299—Inspection Trip | 0 | C.E. 290—Contracts and Specifications | 2 |
| Arch. 143—Materials and Methods of Construction, or C.E. 351—Drainage and Flood Control, or Approved Elective | 3 | Approved Electives | 5 |
| C.E. 262—Structural Analysis | 3 | | |
| C.E. 263—Elementary Structural Design | 2 | | |
| E.E. 202—Direct and Alternating Current Circuits and Machines | 2 | | |
| E.E. 203—Direct and Alternating Current Circuits and Machines Laboratory | 1 | | |
| *Total* | 17 | *Total* | 15 |

### Ceramic Engineering

Ceramic engineering is a wide and expanding field that offers many opportunities. The curriculum is designed to prepare students to enter any of the ceramic industries — glass manufacture, porcelain enamels, structural clay products, refractories, whitewares, pottery, abrasives, and cements. A general introduction to ceramics is offered in the sophomore year, the fundamentals of ceramic engineering in the junior year, and specialization and practical applications in the senior year. Students may specialize toward either production or research in the various branches of the industry. Elective courses in porcelain enamels, glass, cements, pottery, and microscopy are also available for undergraduate students. For graduate students, advanced courses in all phases are presented.

## Curriculum in Ceramic Engineering

*For the Degree of Bachelor of Science in Ceramic Engineering*

### First Year

Common Program for Freshmen (page 42), except that Chem. 105 and Math. 117 and 127 are substituted for Chem. 104 and Math. 112, 114, and 122.

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Cer. E. 101—Introduction to Ceramic Engineering | 3 | Cer. E. 102—Ceramic Processes and Equipment | 3 |
| Chem. 123—Quantitative Analysis | 5 | Geol. 130—Mineralogy for Engineers | 3 |
| Math. 137—Calculus | 3 | Math. 147—Calculus | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military (men) | 1 | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 18 | *Total* | 18 |

### Third Year

| | | | |
|---|---|---|---|
| Cer. E. 201—Ceramic Technology | 5 | Cer. E. 202—Ceramic Technology | 5 |
| Cer. E. 203—Principles of Drying | 3 | Cer. E. 204—Kilns, Furnaces, and Firing Operations | 3 |
| Chem. 245—Elementary Physical Chemistry | 3 | Cer. E. 221—Pyrometry | 2 |
| T.A.M. 221—Resistance of Materials | 3 | Technical Electives | 2 or 3 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | Approved Electives | 5 or 6 |
| Approved Electives | 3 | | |
| *Total* | 18 | *Total* | 17, 18, or 19 |

### Fourth Year

| FIRST SEMESTER | HOURS |
|---|---|
| Cer. E. 211—Ceramic Bodies and Glazes | 5 |
| Cer. E. 271—Ceramic Engineering Design | 2 |
| Cer. E. 299—Inspection Trip | 0 |
| C.E. 260—Structural Engineering | 3 |
| E.E. 202—Direct and Alternating Current Circuits and Machines | 2 |
| E.E. 203—Direct and Alternating Current Circuits and Machines Laboratory | 1 |
| Technical Electives | 2 |
| Approved Electives | 3 |
| *Total* | 18 |

| SECOND SEMESTER | HOURS |
|---|---|
| Cer. E. 218—Refractories | 3 |
| Cer. E. 272—Ceramic Engineering Design | 3 |
| E.E. 204—Application of Electrical Equipment | 2 |
| E.E. 205—Electrical Equipment Laboratory | 1 |
| Technical Electives | 5 or 4 |
| Approved Electives | 3 |
| *Total* | 16 or 17 |

### Chemical Engineering

The curricula in chemical engineering are designed to make students competent to develop, design, and operate new processes, and improve existing processes, in the chemical industries. Training in the fundamentals of chemistry and physics and in the application of mathematics to these sciences is essential before the actual courses in chemical engineering are begun. Since some of the work may involve the design of heavy equipment, students must also understand the principles of mechanical and electrical engineering. Training in engineering drawing, the ability to speak and write English fluently, and skill in reading technical literature in foreign languages are highly useful.

The principles of chemical engineering are based on energy and material balances, and rates of physical and chemical reactions, especially in continuous processes. These principles apply in unit operations like the handling of liquids and gases; the transfer of heat; the absorption of gases; and the processes of extraction, distillation, evaporation, and drying. Seniors solve many practical problems, some of them economic, very much like those found in the modern chemical industry.

Because of the broad scope of chemical engineering training, good high school preparation in chemistry, mathematics, and foreign languages is a requisite. An optional five-year curriculum is offered for students who lack such preparation in chemistry and mathematics and who are specifically interested in administration or sales. Like the regular four-year curriculum, this one also leads to the bachelor of science degree in chemical engineering. For students interested in graduate study the four-year curriculum is strongly recommended.

## Curriculum in Chemical Engineering

*For the Degree of Bachelor of Science in Chemical Engineering*

This curriculum is administered by the College of Liberal Arts and Sciences.

### First Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 107—General Chemistry and Qualitative Analysis | 5 | Chem. 108—General Chemistry and Qualitative Analysis | 5 |
| German, French, or Russian | 4 | German, French, or Russian | 4 |
| Math. 117—Combined Freshman Mathematics[1] | 5 | Math. 127—Combined Freshman Mathematics[1] | 4 |
| Rhet. 101—Rhetoric and Composition | 3 | Rhet. 102—Rhetoric and Composition | 3 |
| Physical Education | 1 | Hygiene 102 or 105—Personal and Environmental Hygiene | 2 |
| Military (men) | 1 | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 17 | *Total* | 18 |

### Second Year

| | | | |
|---|---|---|---|
| Chem. 124—Quantitative Analysis | 5 | General Studies Electives[2] | 3 |
| G.E.D. 106—Elements of Drawing | 3 | Chem. 240—Elementary Physical Chemistry | 3 |
| Math. 137—Calculus | 3 | Chem. 241—Elementary Physical Chemistry Laboratory | 1 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Math. 147—Calculus | 3 |
| Physical Education | 1 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Military (men) | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| | | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 16 | *Total* | 17 |

### Third Year

| | | | |
|---|---|---|---|
| Ch.E. 261—Stoichiometry | 3 | Ch.E. 370—Chemical Engineering Thermodynamics | 3 |
| Ch.E. 267—Measurements and Instrumentation Laboratory | 2 | Ch.E. 371—Principles of Chemical Engineering | 4 |
| Chem. 234—Organic Chemistry | 5 | Ch.E. 372—Unit Operations Laboratory | 2 |
| Chem. 342—Elementary Physical Chemistry | 3 | Chem. 336—Organic Chemistry | 3 |
| General Studies Electives[2] | 3 | Chem. 337—Organic Chemistry Laboratory | 2 |
| | | T.A.M. 221—Resistance of Materials | 3 |
| | | T.A.M. 223—Resistance of Materials Laboratory | 1 |
| *Total* | 16 | *Total* | 18 |

[1] For students who do not take Math. 117 and 127, the required sequence is Math. 112 (or 111), 114 (or 115), 122, 132, and 142.

[2] These electives should be chosen from the Division of Humanities or Social Sciences with the approval of the advisor. The courses are intended to broaden the engineer and provide an interest and liberal education in economics, history, literature, philosophy, political science, or public speaking.

### Fourth Year

| FIRST SEMESTER | HOURS |
|---|---|
| Ch.E. 266—Inspection Trip | ½ |
| Ch.E. 373—Principles of Chemical Engineering | 4 |
| Ch.E. 374—Unit Operations Laboratory | 2 |
| Chem. 344—Principles of Chemical Thermodynamics | 2 |
| E.E. 306—Direct and Alternating Current Circuits | 3 |
| E.E. 307—Direct and Alternating Current Circuits Laboratory | 1 |
| M.E. 204—Mechanical Engineering Laboratory | 2 |
| Electives[1] | 2 or 3 |
| *Total* | 16½ or 17½ |

| SECOND SEMESTER | HOURS |
|---|---|
| Ch.E. 266—Inspection Trip | ½ |
| Ch.E. 377—Chemical Engineering Technology | 3 |
| Ch.E. 379—Chemical Engineering Projects Laboratory | 2 |
| Ch.E. 381—Plant Design | 3 |
| E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 309—Direct and Alternating Current Apparatus Laboratory | 1 |
| Electives[1] | 4 or 5 |
| *Total* | 16½ or 17½ |

[1] Five hours of electives must be chosen with the approval of the advisor from advanced courses in chemical engineering, chemistry, physics, mathematics, or other closely allied subjects.

## Civil Engineering

This curriculum offers systematic training in the principles and procedures employed in professional practice. Emphasis is placed on basic principles and design procedures, rather than on routine computations or on special techniques which can readily be obtained on the job.

The various courses offered concern the design and construction of bridges, buildings, dams, retaining walls, foundations, aircraft structures, and airports; the design, construction, and operation of water supply and sewage disposal systems, highways, and railways; methods and engineering works involved in flood control and drainage; and the preparation of cost estimates, contracts, and specifications. Seniors may specialize somewhat in the more important branches of civil engineering through options in structures; transportation by highway, railway, and airway; and hydraulic engineering.

A summer surveying camp provides field instruction in surveying, between the freshman and sophomore years, and an arrangement is in effect with the Illinois State Highway Department under which students may get engineering experience, with pay, during the next two summers in college.

## Curriculum in Civil Engineering

*For the Degree of Bachelor of Science in Civil Engineering*

### First Year

Common Program for Freshmen (page 42)

C.E. 101, three hours, and C.E. 102, four hours, are required courses which will be taught at the Summer Surveying Camp following the first year.

U. OF ILL. LIB.

## Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| C.E. 103—Route Surveying | 3 | Geol. 150—Geology for Engineers[1] | 3 |
| C.E. 160—Building Construction and Materials | 3 | Math. 142—Calculus | 3 |
| Math. 132—Calculus | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Physical Education | 1 | Econ. 108—Elements of Economics, or Speech 101—Principles of Effective Speaking[1] | 3 |
| Military (men) | 1 | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 18 | *Total* | 18 |

NOTE: Transfer students who have completed two years of work and who have not had any surveying should take C.E. 111, 112, and 203. Special programs can be arranged for these students and others who have not had C.E. 160 or T.A.M. 150, so that they can graduate in two years in certain options, provided they present an equivalent amount of appropriate credit.

## Third Year

| | | | |
|---|---|---|---|
| C.E. 230—Soils and Bituminous Materials | 2 | C.E. 220—Highways | 3 |
| C.E. 235—Plain Concrete | 2 | C.E. 262—Structural Analysis | 3 |
| C.E. 261—Structural Analysis | 4 | C.E. 263—Elementary Structural Design | 2 |
| M.E. 201—Mechanical Power Equipment | 3 | E.E. 202—Direct and Alternating Current Circuits and Machines, or Approved Electives[2] | 2 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | E.E. 203—Direct and Alternating Current Circuits and Machines Laboratory, or Approved Electives[2] | 1 |
| T.A.M. 221—Resistance of Materials | 3 | T.A.M. 232—Fluid Mechanics | 3 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | T.A.M. 234—Fluid Mechanics Laboratory | 1 |
| | | Approved Electives[2] | 2 |
| *Total* | 18 | *Total* | 17 |

## Fourth Year

GENERAL OPTION

| | | | |
|---|---|---|---|
| C.E. 240—Water Supply | 4 | C.E. 241—Sewerage | 3 |
| C.E. 264—Structural Design | 5 | C.E. 270—Foundations and Retaining Walls | 3 |
| C.E. 290—Contracts and Specifications | 2 | C.E. 296—Professional Practice | 0 |
| C.E. 295—Professional Practice | 0 | Technical Electives | 5 |
| C.E. 299—Inspection Trip | 0 | Approved Electives | 4 |
| Technical Electives | 3 | | |
| *Total* | 14 | *Total* | 15 |

[1] Eight hours of credit in foreign language (French, German, or Spanish) may be substituted for Geol. 150 (3 hours), Econ. 108 or Speech 101 (3 hours), and approved electives (2 hours).

[2] Students expecting to obtain their degree in sanitary engineering should replace these with Chem. 122.

### Construction Option

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| C.E. 237—Estimates and Costs | 2 | C.E. 239—Construction Planning and Management | 4 |
| C.E. 238—Construction Equipment and Methods | 3 | C.E. 270—Foundations and Retaining Walls | 3 |
| C.E. 248—Water Supply and Sewerage | 4 | C.E. 290—Contracts and Specifications | 2 |
| C.E. 264—Structural Design | 5 | C.E. 296—Professional Practice | 0 |
| C.E. 295—Professional Practice | 0 | Eng. 230—Labor Relations | 3 |
| C.E. 299—Inspection Trip | 0 | Approved Electives | 3 |
| *Total* | 14 | *Total* | 15 |

### Highway Option

| | | | |
|---|---|---|---|
| C.E. 222—Highway and Municipal Design | 4 | C.E. 223—Traffic Engineering | 3 |
| C.E. 227—Terminals | 2 | C.E. 232—Engineering Properties of Soils | 2 |
| C.E. 231—Advanced Highway Materials | 2 | C.E. 264—Structural Design | 5 |
| C.E. 248—Water Supply and Sewerage | 4 | C.E. 270—Foundations and Retaining Walls | 3 |
| C.E. 290—Contracts and Specifications | 2 | C.E. 296—Professional Practice | 0 |
| C.E. 295—Professional Practice | 0 | Approved Electives | 2 |
| C.E. 299—Inspection Trip | 0 | | |
| *Total* | 14 | *Total* | 15 |

### Hydraulic Option

| | | | |
|---|---|---|---|
| C.E. 250—Hydrology | 3 | C.E. 248—Water Supply and Sewerage | 4 |
| C.E. 252—Water Resources, Planning and Development | 3 | C.E. 255—Water Power | 3 |
| C.E. 264—Structural Design | 5 | C.E. 271—Earth and Masonry Structures | 2 |
| C.E. 270—Foundations and Retaining Walls | 3 | C.E. 290—Contracts and Specifications | 2 |
| C.E. 295—Professional Practice | 0 | C.E. 293—Special Problems, or Approved Electives | 1 |
| C.E. 299—Inspection Trip | 0 | C.E. 296—Professional Practice | 0 |
| | | C.E. 351—Drainage and Flood Control | 3 |
| *Total* | 14 | *Total* | 15 |

### Railway Option

| | | | |
|---|---|---|---|
| C.E. 226—Railway Location and Operation | 3 | C.E. 225—Railway Construction and Maintenance | 3 |
| C.E. 227—Terminals | 2 | C.E. 229—Signals | 2 |
| C.E. 264—Structural Design | 5 | C.E. 232—Engineering Properties of Soils | 2 |
| C.E. 270—Foundations and Retaining Walls | 3 | C.E. 248—Water Supply and Sewerage | 4 |
| C.E. 290—Contracts and Specifications | 2 | C.E. 296—Professional Practice | 0 |
| C.E. 295—Professional Practice | 0 | Econ. 384—Economics of Transportation, or C.E. 238—Construction Equipment and Methods | 3 |
| C.E. 299—Inspection Trip | 0 | | |
| *Total* | 15 | *Total* | 14 |

STRUCTURAL OPTION

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| C.E. 264—Structural Design | 5 | C.E. 248—Water Supply and Sewerage | 4 |
| C.E. 270—Foundations and Retaining Walls | 3 | C.E. 265—Structural Design | 4 |
| C.E. 295—Professional Practice | 0 | C.E. 271—Earth and Masonry Structures | 2 |
| C.E. 299—Inspection Trip | 0 | C.E. 290—Contracts and Specifications | 2 |
| C.E. 361—Statically Indeterminate Structures | 3 | C.E. 296—Professional Practice | 0 |
| Approved Electives | 3 | C.E. 362—Statically Indeterminate Structures | 3 |
| *Total* | 14 | *Total* | 15 |

## Curriculum in Sanitary Engineering

*For the Degree of Bachelor of Science in Sanitary Engineering*

### First Year

Common Program for Freshmen (page 42). C.E. 101, 3 hours, and C.E. 102, 4 hours, are required courses which will be taught only at the summer surveying camp following the freshman year.

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| C E. 103—Route Surveying | 3 | C.E. 140—Engineering in Public Health[1] | 3 |
| C.E. 160—Building Construction and Materials | 3 | Geol. 150—Engineering Geology[2] | 3 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Physics 103—General Physics | 5 | Physics 104—General Physics | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military (men) | 1 | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 18 | *Total* | 18 |

NOTE: Transfer students who have completed two years' work and who have not had any surveying should attend summer surveying camp before starting their third year, otherwise they will take C.E. 111, 112, and 203 on the campus.

### Third Year

| | | | |
|---|---|---|---|
| C.E. 230—Soils and Bituminous Materials | 2 | Chem. 122—Elementary Quantitative Analysis | 5 |
| C.E. 235—Plain Concrete | 2 | C.E. 262—Structural Analysis | 3 |
| C.E. 261—Structural Analysis | 4 | C.E. 263—Elementary Structural Design | 2 |
| Econ. 108—Elements of Economics, or Speech 101—Principles of Effective Speaking[2] | 3 | M.E. 201—Mechanical Power Equipment | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | T.A.M. 232—Mechanics of Fluids | 3 |
| T.A.M. 221—Resistance of Materials | 3 | T.A.M. 234—Fluid Mechanics Laboratory | 1 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | | |
| *Total* | 18 | *Total* | 17 |

Students who have completed three years in civil engineering can complete the sanitary engineering curriculum in one year, provided the substitution of Chem. 122 for the electives shown on page 52 is made in the sixth semester.

[1] Students who have had C.E. 140 are excused from Bact. 104.

[2] Eight hours of credit in foreign language (French, German, or Spanish) may be substituted for Geol. 150 (3 hours), Econ. 108 or Speech 101 (3 hours), and approved electives (2 hours).

### Fourth Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Bact. 104—Introductory Bacteriology[1] | 3 | Chem. 132—Elementary Organic Chemistry | 3 |
| C.E. 220—Highways | 3 | C.E. 241—Sewerage | 3 |
| C.E. 240—Water Supply | 4 | C.E. 264—Structural Design | 5 |
| C.E. 270—Foundations and Retaining Walls | 3 | C.E. 296—Professional Practice | 0 |
| C.E. 295—Professional Practice | 0 | C.E. 345—Public Health Engineering | 3 |
| C.E. 299—Inspection Trip | 0 | | |
| C.E. 344—Water and Sewage Treatment | 5 | | |
| *Total* | 15 or 18 | *Total* | 14 |

[1] Students who have had C.E. 140 are excused from Bact. 104.

## Curriculum in Public Health Engineering

*For the Degree of Bachelor of Science in Public Health Engineering*

### First Four Years

The first four years are the same as the sanitary engineering curriculum. Students who have received the bachelor's degree in sanitary engineering or its equivalent at a recognized college of engineering are admitted to the fifth year in this curriculum providing they have had the necessary prerequisites for the particular courses required at the University. The work for the first semester of the fifth year is offered at Urbana, and the second half of the year is offered at the College of Medicine in Chicago.

### Fifth Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 247—Elementary Physical Chemistry | 4 | C.E. 493—Special Problems | 3 |
| Chem. 326—Chemical Analysis and Treatment of Water | 3 | P.H. 1—Bacteriology and Protozoology | 6 |
| C.E. 345—Public Health Engineering | 3 | P.H. 4—Preventive Medicine | 2 |
| Zool. 101—General Zoology | 4 | P.H. 12—Industrial Hygiene | 1 |
| Approved Electives (D.S. 350, Entom. 103, Math. 161, M.E. 253) | 5 | P.H. 50—Public Health | 1 |
| | | P.H. 73—Advanced Public Health | 2 |
| | | Pharmacology, or Approved Electives | 3 |
| *Total* | 19 | *Total* | 18 |

### Electrical Engineering

Actual work in electrical engineering subjects begins in the sophomore year with a course in electric circuits and fields. Beginning with the third year, the courses are arranged in three options covering the fields of power, illumination, and communication engineering. These options are designed, not to make specialists, but rather to give a wide background in the fundamental theory and methods of attack on some of the more difficult problems. In each option technical courses and accompanying laboratory exercises, covering the generation, transmission, distribution, radiation, measurement, and utilization of electrical energy in all frequency ranges, give a broad general training, supplemented by other courses which emphasize the fields of the options.

Provision is made whereby students may do individual work, particularly experimental investigation, in the junior and senior years —

provided that they have shown exceptional interest and ability in their first two years in college and submit to their advisor an integrated program of study.

## Curriculum in Electrical Engineering

*For the Degree of Bachelor of Science in Electrical Engineering*

### First Year

Common Program for Freshmen (page 42)

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Econ. 108—Elements of Economics | 3 | E.E. 126—Electric Circuits and Fields | 4 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Speech 101—Principles of Effective Speaking | 3 | T.A.M. 154—Analytical Mechanics | 4 |
| Physical Education | 1 | Physical Education | 1 |
| Military (men) | 1 | Military (men) | 1 |
| *Total* | 18 | *Total* | 18 |

### Third Year

Power Engineering and Communication Engineering Options

| | | | |
|---|---|---|---|
| Econ. 248—Personnel Administration | 3 | E.E. 288—Economic Aspects of Engineering | 3 |
| E.E. 320—Circuit Analysis | 4 | E.E. 322—Circuit Analysis | 4 |
| E.E. 321—Circuit Laboratory | 1 | E.E. 323—Circuit Laboratory | 1 |
| Math. 345—Differential Equations and Orthogonal Functions | 3 | E.E. 334—Electrical Power Apparatus, and E.E. 335—Electrical Power Apparatus Laboratory,[1] or E.E. 351—Networks and Lines[2] | 4 |
| M.E. 202—Thermodynamics | 3 | E.E. 340—Electronics | 3 |
| T.A.M. 221—Resistance of Materials | 3 | E.E. 341—Electronics Laboratory | 1 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | Non-technical Electives[3] | 3 |
| *Total* | 18 | *Total* | 19 |

Illumination Engineering Option

| | | | |
|---|---|---|---|
| E.E. 260—Fundamentals of Illumination | 3 | Arch. 217—Architecture and Civilization of the Americas to 1870[4] | 2 |
| E.E. 320—Circuit Analysis | 4 | E.E. 322—Circuit Analysis | 4 |
| E.E. 321—Circuit Laboratory | 1 | E.E. 323—Circuit Laboratory | 1 |
| Math. 345—Differential Equations and Orthogonal Functions | 3 | E.E. 340—Electronics | 3 |
| Psych. 100—Introduction to Psychology[4] | 4 | E.E. 341—Electronics Laboratory | 1 |
| T.A.M. 221—Resistance of Materials | 3 | E.E. 361—Elements of Illuminating Engineering Design | 4 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | Physiol. 101—Mammalian Physiology[4] | 3 |
| *Total* | 19 | *Total* | 18 |

[1] E.E. 334 and 335 to be omitted by students in the communication engineering option.
[2] E.E. 351 to be omitted by students in the power engineering option.
[3] All electives to be chosen from lists approved by the head of the department.
[4] These courses will be waived for students in advanced military, in which case one hour of approved elective will be added.

## Fourth Year

### Power Engineering Option

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| E.E. 268—Principles of Illumination | 2 | E.E. 292—Seminar | 1 |
| E.E. 290—Seminar | 0 | E.E. 338—Electrical Power Apparatus | 3 |
| E.E. 336—Electrical Power Apparatus | 4 | E.E. 339—Electrical Power Apparatus Laboratory | 1 |
| E.E. 337—Electrical Power Apparatus Laboratory | 2 | M.E. 203—Power Plant Equipment | 3 |
| E.E. 347—Industrial Electronics | 4 | Technical Electives[1] | 5 |
| E.E. 378—Fundamentals of Power Transmission | 3 | Non-technical Electives[1] | 3 |
| Non-technical Electives[1] | 3 | | |
| *Total* | 18 | *Total* | 16 |

### Communication Engineering Option

| | | | |
|---|---|---|---|
| E.E. 290—Seminar | 0 | E.E. 292—Seminar | 1 |
| E.E. 330—Electrical Machinery | 3 | E.E. 332—Electrical Machinery | 3 |
| E.E. 331—Electrical Machinery Laboratory | 1 | E.E. 333—Electrical Machinery Laboratory | 1 |
| E.E. 349—Electron Tube Circuits | 5 | E.E. 355—Fields and Waves | 4 |
| E.E. 353—Radio Circuits | 4 | Technical Electives[1] | 3 |
| Technical Electives[1] | 3 | Non-technical Electives[1] | 6 |
| *Total* | 16 | *Total* | 18 |

### Illumination Engineering Option

| | | | |
|---|---|---|---|
| Arch. 218—Architecture and Civilization of the Americas and Europe since 1870[2] | 2 | E.E. 292—Seminar | 1 |
| E.E. 290—Seminar | 0 | E.E. 332—Electrical Machinery | 3 |
| E.E. 330—Electrical Machinery | 3 | E.E. 333—Electrical Machinery Laboratory | 1 |
| E.E. 331—Electrical Machinery Laboratory | 1 | E.E. 364—Illumination Design and Economics | 4 |
| E.E. 347—Industrial Electronics | 4 | E.E. 365—Illumination Design Laboratory | 1 |
| E.E. 362—Principles of Illuminating Engineering | 4 | E.E. 366—Illumination Sources | 4 |
| E.E. 363—Illumination and Photometry Laboratory | 1 | Mktg. 373—Sales Management[2] | 2 |
| Mktg. 272—Industrial Selling | 3 | | |
| *Total* | 18 | *Total* | 16 |

[1] All electives to be chosen from lists approved by the head of the department.
[2] These courses will be waived for students in advanced military, in which case one hour of approved elective will be added.

## General Engineering

The general engineering curriculum is intended for students who do not wish to follow the more technical branches of engineering practice but who wish to prepare themselves for work in management, operation, and construction by combining the study of engineering facts and processes with that of the social and economic disciplines. The curriculum therefore provides a fundamental engineering training with some emphasis on design and with a fixed requirement of fifteen hours in economics, corporate organization, finance, labor relations, and engineering law. Specialization is permitted by means of liberal provisions for elective studies as well as by an option in either structural or machine design.

## Curriculum in General Engineering

*For the Degree of Bachelor of Science in General Engineering*

The mechanical engineering design sequence of courses, namely, M.E. 221, 224, and 271, plus six hours of approved electives will be accepted in place of C.E. 261, 262, 263, 264, and Geol. 150 in the third and fourth years. A sales engineering option can be readily planned within the elective framework of the curriculum.

### First Year

Common Program for Freshmen (page 42)

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Econ. 108—Elements of Economics | 3 | C.E. 115—General Surveying, or M.E. 183—Materials Casting | 3 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| M.E. 183—Materials Casting, or C.E. 115—General Surveying | 3 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Speech 101—Principles of Effective Speaking | 3 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military (men) | 1 | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 18 | *Total* | 18 |

### Third Year

| | | | |
|---|---|---|---|
| Accy. 201—Fundamentals of Accounting | 3 | C.E. 261—Structural Stresses | 4 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 307—Direct and Alternating Current Circuits Laboratory | 1 | E.E. 309—Direct and Alternating Current Apparatus Laboratory | 1 |
| M.E. 184—Metal Processing | 3 | M.E. 202—Thermodynamics | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | T.A.M. 232—Fluid Mechanics | 3 |
| T.A.M. 221—Resistance of Materials | 3 | T.A.M. 234—Fluid Mechanics Laboratory | 1 |
| T.A.M. 223—Resistance of Materials Laboratory | 1 | Approved Electives[1] | 3 |
| *Total* | 17 | *Total* | 18 |

### Fourth Year

| | | | |
|---|---|---|---|
| C.E. 262—Structural Analysis | 3 | C.E. 264—Structural Design | 5 |
| C.E. 263—Elementary Structural Design | 2 | Econ. 257—Corporation Finance | 3 |
| G.E. 299—Inspection Trip | 0 | Eng. 292—Engineering Law | 3 |
| Eng. 230—Labor Relations, or Eng. 239—Industrial Relations | 3 | M.E. 208—Mechanical Engineering Laboratory | 3 |
| M.E. 203—Power Plant Equipment | 3 | Approved Electives | 4 |
| Met. E. 230—Engineering Metallurgy | 3 | | |
| Approved Electives | 4 | | |
| *Total* | 18 | *Total* | 18 |

[1] Geol. 150 for those choosing the structural option.

### Mechanical Engineering

This curriculum presents the theory and practice of the generation, transmission, and utilization of power, and the theory of operation, design, testing, and construction of all types of machines. In the laboratories, emphasis is placed on the engineering and economic principles of machine design, operation, performance, and construction, and on the problems of production management.

During the junior and senior years there is available a wide variety of optional course sequences that permits some emphasis on any one of the following phases: heat power, machine design, production, and railway motor power. All the optional curricula contain the same strong basic courses in science, mathematics, mechanics, and engineering fundamentals throughout the four years. In addition, all curricula provide for courses outside the College of Engineering in the social sciences, literature, and the fine arts.

## Curriculum in Mechanical Engineering

*For the Degree of Bachelor of Science in Mechanical Engineering*

### First Year

Common Program for Freshmen (page 42)

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| M.E. 171—Mechanisms | 2 | M.E. 184—Metal Processing, or M.E. 183—Materials Casting | 3 |
| M.E. 183—Materials Casting, or M.E. 184—Metal Processing | 3 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | T.A.M. 156—Analytical Mechanics (Statics and Dynamics) | 5 |
| Physical Education | 1 | Physical Education | 1 |
| Military (men) | 1 | Military (men) | 1 |
| *Total* | 17 | *Total* | 18 |

### Third Year

| | | | |
|---|---|---|---|
| E.E. 306—Direct and Alternating Current Circuits | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 307—Direct and Alternating Current Circuits Laboratory | 1 | M.E. 206—Thermodynamics | 3 |
| M.E. 205—Thermodynamics | 3 | M.E. 207—Power Plant Equipment | 3 |
| M.E. 223—Mechanics of Machinery | 3 | M.E. 208—Mechanical Engineering Laboratory | 3 |
| T.A.M. 221—Resistance of Materials | 3 | M.E. 224—Design of Machine Elements | 3 |
| Options | 6 | T.A.M. 223—Resistance of Materials Laboratory | 1 |
| | | Options | 3 |
| *Total* | 19 | *Total* | 19 |

### Fourth Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| M.E. 255—Mechanical Engineering Laboratory | 3 | M.E. 260—Heating, Ventilating, and Air Conditioning[1] | 3 |
| M.E. 271—Design of Machine Elements | 3 | M.E. 291—Mechanical Engineering Seminar | 1 |
| M.E. 299—Inspection Trip | 0 | Options | 12 |
| Options | 12 | | |
| *Total* | 18 | *Total* | 16 |

[1] To be taken in the first semester of the air conditioning and refrigeration option in place of approved electives.

All mechanical engineering students take the same subjects the first two years. During the third and fourth years students take the courses specified above and select, with guidance from the department advisors, one of the following options. Departmental electives in these options must be courses numbered above M.E. 249. Approved electives in the senior year must be upper level courses (junior or senior grade).

#### General Option

This option permits selection of the courses to meet the needs of students whose interests differ from those who choose special options.

### Third Year

| | | | |
|---|---|---|---|
| Approved Electives | 3 | Approved Electives | 3 |
| Non-technical Electives | 3 | | |

### Fourth Year

| | | | |
|---|---|---|---|
| M.E. 234—Heat Treatment of Metals | 3 | Departmental Electives | 3 |
| Departmental Electives | 3 | Approved Electives | 6 |
| Approved Electives | 3 | Non-technical Electives | 3 |
| Non-technical Electives | 3 | | |

#### Aeronautical Option

This option is designed for those mechanical engineering students who may be interested in the aircraft industry.

### Third Year

| | | | |
|---|---|---|---|
| Aero. E. 211—Aerodynamics | 3 | Aero. E. 220—Aircraft Structures | 3 |
| Math. 387—Introduction to Applied Mathematics, or Math. 345—Differential Equations and Orthogonal Functions, or Math. 341—Differential Equations | 3 | | |

### Fourth Year

| | | | |
|---|---|---|---|
| Aero. E. 221—Aircraft Structures | 3 | Aero. E. 261—Aerodynamics Laboratory | 2 |
| M.E. 234—Heat Treatment of Metals | 3 | Aero. E. 264—Aircraft Structures Laboratory | 2 |
| M.E. 256—Internal Combustion Engines | 3 | M.E. 258—Combustion Engine and Turbine Laboratory | 3 |
| Non-technical Electives | 3 | Departmental Electives | 3 |
| | | Non-technical Electives | 2 |

### Air Conditioning and Refrigeration Option

This option provides for those interested in heating, ventilating, air conditioning, and refrigeration.

#### Third Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| T.A.M. 232—Fluid Mechanics | 3 | Approved Electives | 3 |
| Non-technical Electives | 3 | | |

#### Fourth Year

| | | | |
|---|---|---|---|
| M.E. 234—Heat Treatment of Metals | 3 | M.E. 259—Refrigeration Engineering | 3 |
| M.E. 254—Heat Transfer | 3 | M.E. 261—Heating, Ventilating, and Air Conditioning Design | 3 |
| M.E. 260—Heating, Ventilating, and Air Conditioning | 3 | Approved Electives | 6 |
| Non-technical Electives | 3 | Non-technical Electives | 3 |

### Design Option

This option provides for specialization in mechanical engineering design.

#### Third Year

| | | | |
|---|---|---|---|
| Approved Electives | 3 | Math. 345—Differential Equations and Orthogonal Functions, or Math. 341—Differential Equations | 3 |
| Non-technical Electives | 3 | | |

#### Fourth Year

| | | | |
|---|---|---|---|
| M.E. 234—Heat Treatment of Metals | 3 | M.E. 272—Analytical Design of High-Speed Engines, or T.A.M. 312—Mechanical Vibrations, or T.A.M. 323—Advanced Laboratory in Materials Testing | 3 |
| T.A.M. 311—Mechanical Vibrations | 3 | M.E. 273—Machine Design | 3 |
| T.A.M. 321—Advanced Mechanics of Materials, or M.E. 284—Welding Engineering | 3 | M.E. 282—Tool Engineering, or T.A.M. 326—Experimental Stress Analysis, or M.E. 272—Analytical Design of High-Speed Engines | 3 |
| Non-technical Electives | 3 | Non-technical Electives | 3 |

### Petroleum Production Option

This option is designed for those students interested in the mechanical engineering aspects of petroleum production.

#### Third Year

| | | | |
|---|---|---|---|
| Geol. 150—Geology for Engineers | 3 | Geol. 102—Historical Geology | 4 |
| T.A.M. 232—Fluid Mechanics | 3 | | |

#### Fourth Year

| | | | |
|---|---|---|---|
| Geol. 246—Applied Petroleum Geology | 3 | C.E. 115—General Surveying | 3 |
| M.E. 234—Heat Treatment of Metals | 3 | Geol. 247—Applied Petroleum Geology | 3 |
| M.E. 371—Petroleum Production Engineering | 3 | M.E. 372—Petroleum Production Engineering | 3 |
| Non-technical Electives | 3 | Non-technical Electives | 2 |

### Power Option

This option is for those students whose interests lie in the field of steam and gas power.

#### Third Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| T.A.M. 232—Fluid Mechanics | 3 | M.E. 234—Heat Treatment of Metals | 3 |
| Non-technical Electives | 3 | | |

#### Fourth Year

| | | | |
|---|---|---|---|
| M.E. 254—Heat Transfer | 3 | M.E. 257—Gas Turbines | 3 |
| M.E. 256—Internal Combustion Engines | 3 | M.E. 258—Combustion Engine and Turbine Laboratory | 3 |
| T.A.M. 311—Mechanical Vibrations | 3 | M.E. 274—Power Plant Design | 3 |
| Non-technical Electives | 3 | Non-technical Electives | 3 |

### Production Option

This option provides emphasis on the production engineering aspects of mechanical engineering to meet the needs of those students planning on a career in the manufacturing industry.

#### Third Year

| | | | |
|---|---|---|---|
| Econ. 108—Elements of Economics | 3 | M.E. 234—Heat Treatment of Metals | 3 |
| M.E. 232—Motion and Time Study | 3 | | |

#### Fourth Year

| | | | |
|---|---|---|---|
| M.E. 231—Advanced Metal Processing | 3 | M.E. 282—Tool Engineering | 3 |
| M.E. 281—Production Control | 3 | M.E. 283—Industrial Plant Design | 3 |
| M.E. 284—Welding Engineering | 3 | Approved Electives | 3 |
| Non-technical Electives | 3 | Non-technical Electives | 3 |

### Research Option

This option is intended for students interested in research and development.

#### Third Year

| | | | |
|---|---|---|---|
| Math. 387—Introduction to Applied Mathematics, or Math. 345—Differential Equations and Orthogonal Functions, or Math. 341—Differential Equations | 3 | M.E. 234—Heat Treatment of Metals | 3 |
| T.A.M. 232—Fluid Mechanics | 3 | | |

#### Fourth Year

| | | | |
|---|---|---|---|
| M.E. 254—Heat Transfer | 3 | M.E. 298—Thesis, or Approved Elective | 3 |
| M.E. 297—Experimental Investigations | 3 | T.A.M. 311—Mechanical Vibrations | 3 |
| Non-technical Electives | 6 | T.A.M. 321—Advanced Mechanics of Materials, or E.E. 212—Electronics | 3 |
| | | Non-technical Electives | 3 |

Railway Option

This option permits specialization in railway mechanical engineering.

### Third Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| T.A.M. 232—Fluid Mechanics | 3 | M.E. 234—Heat Treatment of Metals | 3 |
| Non-technical Electives | 3 | | |

### Fourth Year

| | | | |
|---|---|---|---|
| M.E. 231—Advanced Metal Processing | 3 | M.E. 259—Refrigeration Engineering | 3 |
| M.E. 256—Internal Combustion Engines | 3 | M.E. 274—Power Plant Design | 3 |
| M.E. 361—Railway Motive Power Equipment | 3 | M.E. 362—Railway Motive Power Operation | 3 |
| Non-technical Electives | 3 | Non-technical Electives | 3 |

## Mining and Metallurgical Engineering

The training in mining engineering and metallurgical engineering is presented in two distinct curricula.

*Mining Engineering.* This curriculum treats the fundamental engineering problems involved in extracting coal and minerals from the earth, and the preliminary preparation of coal and minerals for use in our civilization. Specialized courses include prospecting, mine surveying, mining methods, mine examination, mine ventilation, coal preparation, mineral dressing, mine administration, and the design of mine plants. Interwoven throughout the curriculum is a series of required courses which provide the broad engineering background demanded by the mining industries and are largely responsible for the great success with which the University of Illinois is meeting that increasing demand.

*Metallurgical Engineering.* Equally wide demands on the colleges are made by the metallurgical industries. The curriculum in metallurgical engineering at the University of Illinois therefore includes thorough treatment of the engineering fundamentals of the three main divisions of metallurgy — chemical, mechanical, and physical; emphasis is placed on the third of these, in accordance with the greatest needs of industry. Technical courses give specialized work in ferrous and nonferrous process metallurgy, the metallurgy of deep drawing and pressing, physical metallurgy, ferrous and nonferrous metallography, physics of metals, electrometallurgy, heat treatment, fuels and furnaces, and alloy steels. Elective courses enable each student to satisfy his individual interests.

# Curriculum in Mining Engineering

*For the Degree of Bachelor of Science in Mining Engineering*

## First Year

Common Program for Freshmen (page 42)

## Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Geol. 150—Geology for Engineers | 3 | Geol. 130—Mineralogy for Engineers | 3 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Min. E. 151—Elements of Mining | 4 | Min. E. 152—Fuels | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military (men) | 1 | Physical Education | 1 |
| | | Military (men) | 1 |
| *Total* | 19 | *Total* | 18 |

## Third Year

| | | | |
|---|---|---|---|
| C.E. 115—General Surveying | 3 | Econ. 240—Labor Problems, or Econ. 248—Personnel Administration | 3 |
| Econ. 108—Elements of Economics | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | E.E. 309—Direct and Alternating Current Apparatus Laboratory | 1 |
| E.E. 307—Direct and Alternating Current Circuits Laboratory | 1 | Geology Elective | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | M.E. 201—Steam, Air, and Gas Machinery | 3 |
| T.A.M. 232—Fluid Mechanics | 3 | Min. E. 204—Mine Surveying | 2 |
| T.A.M. 234—Fluid Mechanics Laboratory | 1 | T.A.M. 221—Resistance of Materials | 3 |
| | | T.A.M. 223—Resistance of Materials Laboratory | 1 |
| *Total* | 17 | *Total* | 19 |

## Summer

First and Second Weeks

Min. E. 205—Summer Mine Surveying ..... 2 hours

## Fourth Year

| | | | |
|---|---|---|---|
| Min. E. 251—Mine Administration | 3 | Met. E. 230—Engineering Metallurgy | 3 |
| Min. E. 253—Principles of Mining Methods | 4 | Min. E. 256—Mine Examination and Valuation | 2 |
| Min. E. 255—Mineral Dressing | 3 | Min. E. 258—Mining Design | 3 |
| Min. E. 257—Haulage, Hoisting, and Pumping | 4 | Min. E. 260—Coal Preparation | 2 |
| Min. E. 299—Inspection Trip | 0 | Min. E. 262—Mine Ventilation | 3 |
| Min. E. 351—Geophysics of Mining | 3 | Min. E. 396—Seminar | 1 |
| | | Approved Elective | 1 |
| *Total* | 17 | *Total* | 15 |

## Curriculum in Metallurgical Engineering

*For the Degree of Bachelor of Science in Metallurgical Engineering*

### First Year

Common Program for Freshmen (page 42), except that Chem. 105 and G.E.D. 106 are substituted for Chem. 104 and G.E.D. 101.

### Second Year

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 123—Quantitative Analysis for Engineers | 5 | Math. 142—Calculus | 3 |
| Math. 132—Calculus | 5 | Met. E. 150—Introduction to Metallurgy | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Military (men) | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Physical Education | 1 | Military (men) | 1 |
| | | Physical Education | 1 |
| | | Approved Electives | 3 |
| *Total* | 17 | *Total* | 18 |

### Third Year

| | | | |
|---|---|---|---|
| Cer. E. 221—Pyrometry | 2 | Chem. 246—Elementary Physical Chemistry | 3 |
| Chem. 245—Elementary Physical Chemistry | 3 | Met. E. 208—Ferrous Metallography | 3 |
| Met. E. 201—Principles of Physical Metallurgy | 3 | Met. E. 210—Ferrous Metallography Laboratory | 3 |
| Met. E. 203—Physical Metallurgy Laboratory | 1 | Met. E. 214—Electrometallurgy | 2 |
| Met. E. 205—Metallurgy of Iron and Steel | 3 | Met. E. 216—Electrometallurgy Laboratory | 1 |
| Met. E. 207—Metallurgical Calculations | 2 | T.A.M. 221—Resistance of Materials | 3 |
| Approved Electives | 3 | T.A.M. 223—Resistance of Materials Laboratory | 1 |
| | | Approved Electives | 3 |
| *Total* | 17 | *Total* | 19 |

### Fourth Year

| | | | |
|---|---|---|---|
| E.E. 202—Direct and Alternating Current Circuits and Machines | 2 | E.E. 204—Applications of Electrical Equipment | 2 |
| E.E. 203—Direct and Alternating Current Circuits and Machines Laboratory | 1 | E.E. 205—Electrical Equipment Laboratory | 1 |
| Met. E. 251—Nonferrous Metallography | 3 | Met. E. 256—Metallurgy of Deep Drawing and Pressing | 3 |
| Met. E. 253—Nonferrous Metallography Laboratory | 3 | Met. E. 258—Alloy Steels | 3 |
| Met. E. 255—Metallurgy of Nonferrous Metals | 3 | Met. E. 260—Advanced Physical Metallurgy Laboratory | 3 |
| Met. E. 295—Metallurgical Seminar | 1 | Met. E. 296—Metallurgy Seminar | 1 |
| Met. E. 299—Inspection Trip | 0 | Approved Electives | 4 |
| T.A.M. 323—Advanced Laboratory in Materials Testing | 3 | | |
| Approved Electives | 3 | | |
| *Total* | 19 | *Total* | 17 |

### Physics

The curriculum in engineering physics is designed to give the thorough fundamental training necessary in view of the increasing complexity of engineering research, development, and application. The work of the first two years is much like that in the other engineering curricula. In the last two years, stress is placed on advanced courses in physics, mathematics, and chemistry. However, a liberal amount of time is allowed for the study of any branch of engineering in which the student is especially interested; the details of technical application are left to be learned in connection with a particular job. By careful choice of electives, the curriculum can be made to serve as a basis for graduate study in some field of engineering or in physics itself.

Besides offering the curriculum in engineering physics, the Department of Physics teaches those courses in general physics which are required of all engineering students. In fact, it further serves the University by offering similar courses to students in other colleges.

Students who wish additional work in physics will find advanced courses available in electricity and electronics, heat, light and optics, radiation, and nuclear physics.

## Curriculum in Engineering Physics

*For the Degree of Bachelor of Science in Engineering Physics*

### First Year

Common Program for Freshmen (page 42), except that substitution of Chem. 106 for Chem. 104 is advised.

### Second Year[1]

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| German, or Approved Elective | 4 | German, or Approved Elective | 4 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military (men) | 1 | Physical Education | 1 |
| Approved Electives | 3 | Military (men) | 1 |
| | | Approved Electives | 3 |
| *Total* | 19 | *Total* | 19 |

[1] The election of Chem. 110, 124, and 234 is advised. Students wishing to emphasize chemistry may substitute chemistry electives for E.E. 320 and 321. Students wishing to emphasize electrical engineering should elect E.E. 350 and 351, 352 and 353, and 354 and 355 in their fourth year. Students wishing to emphasize geophysics should elect most or all of their technical options in geology. Five hours must be approved non-technical courses.

### Third Year[1]

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| E.E. 320—Circuit Analysis | 4 | Math. 345—Differential Equations and Orthogonal Functions[2] | 3 |
| E.E. 321—Circuit Laboratory | 2 | Physics 322—Theoretical Mechanics | 3 |
| Math. 343—Advanced Calculus[2] | 3 | Physics 342—Electricity and Magnetism | 3 |
| Physics 281—Intermediate Atomic Physics | 3 | Physics 343—Vacuum Tube Circuits[3] | 4 |
| Physics 321—Theoretical Mechanics | 3 | Physics 360—Heat, or M.E. 205—Thermodynamics | 3 |
| Physics 341—Electricity and Magnetism | 3 | Approved Electives | 3 |
| *Total* | 18 | *Total* | 19 |

### Fourth Year[1]

| | | | |
|---|---|---|---|
| Physics 344—Vacuum Tube Circuits,[3] or Technical Option[4] | 4 | Chem. 240—Elementary Physical Chemistry | 3 |
| Physics 371—Light | 2 | Physics 372—Light | 2 |
| Physics 373—Light Laboratory | 2 | Physics 374—Light Laboratory | 2 |
| Approved Electives | 6 | Approved Electives | 5 |
| Technical Option[4] | 3 | Technical Option[4] | 3 |
| *Total* | 17 | *Total* | 15 |

[1] The election of Chem. 110, 124, and 234 is advised. Students wishing to emphasize chemistry may substitute chemistry electives for E.E. 320 and 321. Students wishing to emphasize electrical engineering should elect E.E. 350 and 351, 352 and 353, and 354 and 355 in their fourth year. Students wishing to emphasize geophysics should elect most or all of their technical options in geology. Five hours must be approved non-technical courses.

[2] Math. 341 and 342, or Math 347 and 348 may be substituted for Math. 343 and 345.

[3] Students desiring to emphasize electrical engineering may elect, if they so desire, E.E. 342 and 343 and E.E. 344 and 345 instead of Physics 343 and 344. These students should register in E.E. 350 and 351 concurrently with E.E. 342 and 343, or Physics 343; E.E. 344 and 345, or Physics 344 may be taken concurrently with E.E. 352 and 353. This allows E.E. 354 and 355 to be taken the second semester of the fourth year.

[4] Technical options: Chem. 110, 124, 234, 241, 336, 337, 342, 343, 344, 397, 398; E.E. 330 and 331, 344 and 345, 350 and 351, 352 and 353, 354 and 355; Geol. 102, 150, 246; Math. 161, 317 and 318, 327 and 328, 347 and 348, 361, 385, 387, 388; M.E. 184, 371, 372; any courses in physics or astronomy; T.A.M. 211, 221, 223.

### General Engineering Drawing

The service function of the Department of Physics allies it with two other departments — General Engineering Drawing, and Theoretical and Applied Mechanics. Unlike the Department of Physics, however, neither of these offers degrees. Both provide basic and advanced courses necessary to engineering students in all curricula.

The engineering drawing courses develop the theory, skills, and techniques needed for the preparation and understanding of engineering plans and designs by means of graphic media. Both lettering and drawing are taught in elementary and advanced courses. The work in descriptive geometry is coordinated with the other drawing courses and includes practical problems in engineering. The courses give an invaluable background because they stress the use of methods of exact geometrical analysis and the ability to reason and to visualize.

### Theoretical and Applied Mechanics

The purpose of courses offered by the Department of Theoretical and Applied Mechanics is to train students in the analysis and solution of engineering problems by applying the principles of mathematics and mechanics to the design, construction, and operation of structures and machines.

In the laboratory work, given in conjunction with classroom instruction, many materials are tested — steel, brass, aluminum, wood, concrete. The results of the tests reveal the properties possessed by these materials, and form the basis both for determining which materials can be used in the design and construction of engineering equipment and for preparing written specifications. The laboratory projects involve the latest developments in testing methods and procedures. Equipment capable of providing extreme testing conditions of temperature, pressure, and speed is employed.

In the hydraulics and fluid mechanics laboratory, experiments are performed on the flow of oil and water in pipes, on the flow of water in open channels, on the viscosity of many fluids, and on the operation of various pumps and turbines. Among the junior and senior elective courses are a number in the analysis of stresses in materials, the testing of materials, and hydraulics and fluid mechanics.

*A class in Descriptive Geometry*

## STUDENT ADVISORS

All departments of the College operate an advisory system, with faculty members assigned to guide and counsel specified individual students or specified groups. In addition, there is a representative of the College on the University Student Counseling Bureau.

The names of the current departmental advisors follow. Their offices, office hours, and University telephone numbers will be found in the *Staff Directory*.

### *Aeronautical Engineering*

Aerodynamics Option: M. Z. Krzywoblocki, A. I. Ormsbee, H. S. Stillwell.

Structures Option: J. M. Coan, E. P. Eales, H. H. Hilton.

Propulsion Option: R. W. McCloy, Paul Torda.

Preregistration Scheduling: R. W. McCloy, E. J. Seagrist.

### *Agricultural Engineering*

Farm Structures: D. G. Carter.

Power and Machinery: G. E. Pickard.

Rural Electrification: E. W. Lehmann.

Soil and Water Engineering: R. C. Hay.

### *Ceramic Engineering*

Freshmen: R. L. Cook; Sophomores and Juniors: A. W. Allen; Seniors: R. K. Hursh.

### *Chemical Engineering*

All students: H. F. Johnstone.

### *Civil Engineering*

Jamison Vawter, Chairman; Sophomores: W. H. Rayner, M. O. Schmidt; Juniors: E. R. Bretscher, Ellis Danner, W. E. Hanson; Seniors: J. G. Clark, F. A. Reickert, J. C. Dietz.

### *Electrical Engineering*

C. A. Keener, General Chairman

Second semester Freshmen and first semester Sophomores: H. K. Polk, Chairman

A–Fla, V. P. Hessler; Flb–Le, W. E. Miller; Lf–Ri, H. K. Polk; Rj–Z, M. B. Reed.

Second semester Sophomores, Juniors, and Seniors: E. F. DeMers, Chairman

Communication Option: A–Br, W. G. Albright; Bs–Dr, J. A. Barkson; Ds–Goo, W. H. Byers; Gop–Jo, M. H. Crothers; Jp–Le, R. S. Elliott; Lf–Mo, P. K. Hudson; Mp–Po, M. S. McVay; Pp–Sha, P. F. Schwarzlose; Shb–Tu, C. E. Skroder; Tv–Z, H. D. Webb.

*Student counseling service — one of many services offered by the College*

Power Option: A–Cl, D. S. Babb; Cm–Gek, P. R. Egbert; Gel–Ki, D. F. Hang; Kj–Me, M. S. Helm; Mf–Qz, A. R. Knight; R–Su, R. M. Wainwright; Sv–Z, J. E. Williams.

Illumination Option: J. O. Kraehenbuehl or H. W. Horn.

Undergraduate Military: A. D. Bailey.

Transfer Students, Combined Options, etc. (for assignment): C. A. Keener.

### *Mechanical Engineering*

General Option:* A–C, D. G. Ryan or G. L. Jenkins; D–F, W. L. Hull or C. H. McClay; G–I, W. N. Espy or L. M. Zubko; J–L, J. H. Potter or J. L. Whisenand; M–O, R. C. Juvinall or L. E. Doyle; P–R, A. E. Noreen; S–U, E. F. Hebrank or R. P. Strout; V–Z, J. A. Henry or G. F. Schrader.

Design Option: A–F, E. L. Broghamer; G–L, Francis Seyfarth; M–R, C. D. Greffe; S–Z, J. W. Bayne.

Power Option: A–H, E. D. Luke; I–P, D. H. Krans; Q–Z, H. D. Bareither.

Production Option: A–H, K. J. Trigger; I–P, Everett Laitala; Q–Z, L. C. Pigage.

* The two advisors in each letter group may divide students between them as desired.

Air Conditioning and Refrigeration Option: A–H, R. J. Martin; I–P, J. R. Carroll; Q–Z, J. R. Fellows.
Aeronautical Option: J. C. Miles.
Petroleum Production Option: R. F. Larson.
Railway Option: H. J. Schrader.

*Mining and Metallurgical Engineering*

Students in mining and metallurgical engineering are proportioned among the members of the teaching staff. Specific assignments are made at registration.

*Engineering Physics*

E. M. Lyman or A. O. Hanson.

## DEVELOPING PERSONALITY AND GOOD CITIZENSHIP

Let's repeat briefly what has been said: There's more to an education than gaining knowledge and developing mental abilities. In addition, a man must know how to get along with other people and how to contribute to citizenship in a democracy.

You could improve your personality somewhat, and learn more about people, merely by reading books and by studying what successful men have done. But a much better way is to get out and mix with your fellow students, and to take part in some of the many extra-curricular activities at the University. Not only is this a better way — it's more enjoyable.

Many engineering students have to work so hard on their studies that they feel they don't have enough time to go in for parties and activities. They say you can't do that and still get top grades.

Well, no matter what grades they make, they're wrong. If you're like most students, getting into these activities will actually help you make better grades, because you learn to study better. If you participate in a student activity it may take a few hours away from study, but the experience you gain will help you to study more effectively and become a better student. One reason is that a man who is successful in extra-curricular jobs learns a good deal about budgeting his time and working efficiently. He can carry this knowledge over to his study methods. A second reason is that extra-curricular activities teach you much about how people's minds work and what their reactions are; and, increasingly in your work, knowledge of human psychology as well as of impersonal things becomes essential.

There is a still further advantage from extra-curricular activities. They help to round out your college life in the same way a hobby rounds out your professional life later on. They give you a chance to relax from

the day-to-day grind of studying. A person has to have this relaxation if he is to be happy and get the most out of his college career.

The main extra-curricular activities that you can get into in the College of Engineering are described in this section. There are, of course, many university-wide activities; they are omitted here because you can learn about them from other booklets published by the University.

### Student Professional Societies

With the exception of the recent ones, practically all of the societies started out as clubs, and were later chartered as student branches by the parent national societies. The present list includes:

The American Society of Civil Engineers
The American Society of Mechanical Engineers
The American Institute of Electrical Engineers — Institute of Radio Engineers
The American Ceramics Society
The American Society of Agricultural Engineers
The Mineral Industries Society
The Institute of the Aeronautical Sciences
The Illuminating Engineers Society
The Institute of Traffic Engineers
The Society of Automotive Engineers
The American Foundrymen's Society

Outside the College are:

The American Institute of Chemical Engineers
The Junior Branch, American Institute of Architects

As you can see, each of these societies is related to a particular field of work. With slight differences, nearly all are organized to promote interest in the parent group, to advance professional spirit and ethics, and to provide a meeting place for students, faculty, and eminent practicing engineers. The monthly or bi-weekly meetings ordinarily have programs featuring students or prominent speakers. Most societies also sponsor picnics, smokers, and ball games throughout the year. Membership, which is entirely voluntary, should be seriously considered any time after your freshman year.

### Honor Fraternities

In addition to the professional societies, many departments are also represented by the honor fraternities, two of which cross departmental boundaries to include all engineers. These fraternities are:

*Crowning the queen of St. Pat's Ball*

Tau Beta Pi — all-engineering
Sigma Tau — all-engineering
Eta Kappa Nu — Electrical Engineering
Keramos — Ceramic Engineering
Pi Tau Sigma — Mechanical Engineering
Chi Epsilon — Civil Engineering
Alpha Sigma Mu — Metallurgical Engineering
Gargoyle — Architecture and Architectural Engineering
Phi Lambda Upsilon — Chemical Engineering
Sigma Xi — Chemical Engineering Research

Most of these have national affiliations. Since they are organized primarily to recognize and promote scholarship, you have to be voted into them and consequently you must have a minimum scholastic standing to be selected.

### The Engineering Council

Ever since 1894, when the Association of Engineering Societies of the University of Illinois was set up, some kind of student supervisory organization has been more or less active. The first group was made up of the three student organizations then in existence — the Civil Engineers' Club, the Mechanical and Electrical Society, and the Architects' Club.

In 1905 the Electrical Engineering Society joined the Association. Additions in 1910 were the Chemistry Club and the Mining Society. The Association then changed its name to the Engineering Societies of the University of Illinois. With only a few shifts in membership the organization stayed this way until 1920.

It was followed by the Engineering Council, which was set up to coordinate certain engineering activities. In the main, the membership of the Council was made up of the various engineering societies, the *Illinois Technograph,* and (later) a representative from the Illini Union. This Council worked until about 1939, when a short-lived organization called the Illini Engineers took its place, with membership on an individual basis rather than by societies. The war, of course, stopped any further attempts at organization.

Shortly after the war, a committee of representatives from each of the professional engineering societies, and the editor and business manager of the *Illinois Technograph,* wrote the constitution for a new Engineering Council. This organization was approved by the eight participating societies in the fall of 1947. It exists to coordinate the activities of the various societies, to promote the interest of all engineering students in extra-curricular activities, and to supervise such functions as St. Pat's Ball and the Illinois Student Engineering Exhibit. The Council consists of two members from each member society — the vice-president and an elected representative — plus the editor and the business manager of the *Illinois Technograph.* Four new member societies have been admitted since the council was started.

### The *Illinois Technograph*

One of the foremost engineering student activities is the *Illinois Technograph,* the technical magazine published by the students in the College of Engineering, which was started in 1886 under the title *Selected Papers of the Civil Engineers' Club.* The first year's papers were published in four volumes. Volume 5 appeared in the fall of 1890 under its present title, and the Mechanical Engineers' Society helped to put it out. In 1894 the publication procedure was radically changed by the establishment of the Association of the Engineering Societies, part of whose purpose was to sponsor the *Illinois Technograph* and provide a publication staff.

From then until about 1909 the magazine was published yearly and contained articles of high technical quality. Because of financial and other difficulties, the magazine was reorganized in that year. It appeared four times a year thereafter, with good but somewhat less technical articles, until 1918.

In 1920 the magazine was again completely revamped, and was taken over by the Illini Publishing Company, a nonprofit corporation organized to publish all of the University student periodicals. The format was revised, but it still was issued quarterly. Three years later it joined the Engineering College Magazines Associated. It remained a quarterly until 1930, when it became a monthly and began to feature student-written articles and to give more space to news about the engineering societies. Changes from 1934 to 1939 were relatively minor. Since 1939, eight monthly numbers have been issued each year.

Published almost continuously since its beginning in 1886, the magazine has fairly consistently maintained its policy of printing material prepared by the students, graduates, or faculty of the College of Engineering. This policy has given the staff members excellent editorial and business experience and has proved invaluable in encouraging students to prepare technical material for presentation to societies and for later publication.

*One of the floats in the Illinois Student Engineering Exhibit parade*

*The UHF laboratory for investigating television and other ultra-high frequency circuits*

### Miscellaneous Activities

At various times in the past, engineering students have got together to put on several different types of functions. Except for strictly departmental or individual society affairs, these were sponsored and directed by what is now the Engineering Council. The students in the participating organizations contributed most of the ideas and did most of the work. Student engineering exhibitions, Engineers' Day, St. Pat's Ball, and departmental smokers and dinners are among the activities which have helped to provide the students with fun and fellowship.

1. *Student Engineering Exhibits.* About 1906, the department of physics began holding annual exhibits by students and staff to demonstrate departmental equipment to visitors. In 1907 the first Electrical Engineering Show was held, to raise funds for a contribution to a memorial to Robert Fulton in New York City. The exhibit went over so well with visitors that the show was held periodically up to 1942. In 1914, 1915, 1917, and 1919 a Mechanical Engineering Open House was put on by the Student Branch of the American Society of Mechanical Engineers. In 1920 the students in the mechanical engineering department joined with those in other departments to present the first Engineering Open House. This all-engineering exhibit was held on March 23, 1920, to commemorate the bicentennial of James Watt's birth. Exhibits

were held in 1921 and every two years thereafter until 1941. From 1928, the Engineering Open House, or Illinois Student Engineering Exhibition (I SEE) as it was later known, and the Electrical Engineering Show were presented on alternate years until the war stopped them.

The first postwar exhibit sponsored by the Engineering Council was held on March 31 and April 1, 1950. The activities opened with a parade of floats on Friday noon and concluded with St. Pat's Ball Saturday night. Future exhibits will be held biennially, alternating with the Engineers' Day exercises.

2. *Illinois Engineers' Day.* The first Illinois Engineers' Day was held on March 23, 1920, along with the commemorative exercises to James Watt and the Engineering Open House. Engineers' Day exercises were then held every year from 1922 to 1925. Most of them featured an all-engineering convocation at the Auditorium, preceded by a parade and usually followed in the evening by the Engineers' Dance.

They were reactivated by the Engineering Council in the spring of 1949 and again centered around the convocation at the Auditorium. In addition to prominent speakers, the program featured the presentation of

*A class demonstration in the Farm Machinery laboratory*

awards to the staff member of each department who was outstanding in teaching excellence. Engineers' Day activities are to be held biennially.

3. *St. Pat's Ball.* The custom of holding annual engineers' dances was begun in 1910, discontinued in 1916, and resumed in 1923-27 and again in 1934-39. Those of the 1930's were known as St. Pat's Ball. The tradition of celebrating St. Patrick's Day with a dance in his honor was originated at the University of Missouri about 1922. St. Pat's Ball was started again in 1947 by a group of students who also pointed the way toward the setting up of the present Engineering Council. The Council has since been responsible for sponsoring St. Pat's Ball as one of the outstanding annual social events for engineering students.

4. *Dinners and Smokers.* Although several smokers have been held in the past on a college-wide basis, most are now held as one of the meetings of the various engineering societies. Many departments also sponsor banquets for the graduating senior class, but in the main the dinner meetings, smokers, and other informal gatherings are sponsored by the professional and honorary societies.

This discussion of the activities may have implied that they function under their own power. Of course they do not. Their success depends upon how well you, as a participating student, contribute your share of effort. These activities and others throughout the University will give you innumerable opportunities for reaching the social and civic part of your educational objective. Only by associating with other students and with faculty members connected with these activities can you develop the broad mental outlook and personality you'll need for a successful career and for effective citizenship.

## GRADUATE STUDY

Whether to take graduate work, and when, is a complicated decision or set of decisions. Should you go right into industry and take advantage of the training courses it offers, or should you stay on and study for the M.S. or even for the Ph.D. degree?

Most men find that a sensible decision can hardly be made before the senior year. We suggest that as a sophomore or a junior you investigate the graduate offerings available in your department and related departments. Find out what they call for in the way of background knowledge, ability to use foreign languages, and special technical skills. Make another inventory as you get within a few months of graduation. At that

time, too, talk with faculty members and with men in industry about the over-all economic picture and about prospects in the industries that interest you — prospects for you if you go to work after getting your B.S. degree, prospects for you if you have a higher degree.

Two other matters: If you are seriously planning to take graduate study at Illinois, first find out about the method of administration — for example, about the relationship between your department and the Graduate College, which would administer your work as a whole. Second, as a graduate student, continue to take part in health-building activities and in all extra-curricular affairs (there are more than you might think) that will be open to you.

## IV. WHAT HAVE YOU LEARNED?

The purpose of this booklet has been to give you a general picture of the engineering profession and to point out the kind of engineering education you can expect to get at the University of Illinois if you decide to become an engineer.

The following points are the important ones presented in this booklet — the points that are worth repeating:

1. One excellent way to choose any career is to analyze yourself, analyze the careers you're interested in, and then compare the analysis of yourself with that of each of the careers. You can then feel reasonably certain that you will be successful and happy in any of the careers that match you most closely.
2. Engineering is not easy. At the same time, if you have the desire and abilities to become an engineer, no career is more satisfying or important.
3. If you want to become an engineer, you should concentrate in high school on English, mathematics, and science courses rather than shop courses.
4. To become a good engineer, you should also take as many college courses as you can in subjects like economics, business administration, industrial relations, history, and philosophy.
5. The College of Engineering at the University of Illinois is especially designed to help you gain knowledge, improve your mental skills, and develop your personality so that you can become a good engineer and a good citizen.

# FAITH OF THE ENGINEER

I AM AN ENGINEER. In my profession I take deep pride, but without vainglory; to it I owe solemn obligations that I am eager to fulfill.

As an engineer, I will participate in none but honest enterprise. To him who has engaged my services, as employer or client, I will give the utmost of performance and fidelity.

When needed, my skill and knowledge shall be given without reservation for the public good. From special capacity springs the obligation to use it well in the service of humanity; and I accept the challenge that this implies.

Jealous of the high repute of my calling, I will strive to protect the interests and good name of any engineer that I know to be deserving; but I will not shrink, should duty dictate, from disclosing the truth regarding anyone who, by unscrupulous act, has shown himself unworthy of the profession.

Since the Age of Stone, human progress has been conditioned by the genius of my professional forebears. By them have been rendered usable to mankind Nature's vast resources of material and energy. By them have been vitalized and turned to practical account the principles of science and the revelations of technology. Except for this heritage of accumulated experience, my efforts would be feeble. I dedicate myself to the dissemination of engineering knowledge, and especially to the instruction of younger members of my profession in all its arts and traditions.

To my fellows I pledge, in the same measure I ask of them, integrity and fair dealing, tolerance and respect, and devotion to the standards and the dignity of our profession; with the consciousness, always, that our special experience carries with it the obligation to serve humanity with complete sincerity.

UNIVERSITY OF ILLINOIS-URBANA
3 0112 111989395